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Soil Survey

Catoosa County Georgia

By
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UNITED STATES DEPARTMENT OF AGRICULTURE
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In cooperation with the
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SOIL SURVEY OF CATOOSA COUNTY, GEORGIA

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United States Department of Agriculture, in cooperation with the University of Georgia, College of Agriculture[2]

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COUNTY SURVEYED

Catoosa County is in the northwestern part of Georgia (fig. 1). Tennessee forms its northern boundary, and Dade and Walker Counties, Ga., separate it from the Alabama State line. Ringgold, the county seat, is about 95 miles northwest of Atlanta, Ga., and 15 miles southeast of Chattanooga, Tenn. The area of the county is 169 square miles, or 108,160 acres.

Catoosa County lies in the Ridge and Valley physiographic province, which extends from central Alabama to northern New Jersey. In Georgia this section is known as the Valley. It lies at a lower elevation than Lookout Plateau (part of the Appalachian Plateaus province), which lies from 5 to 12 miles to the west. It also lies at a lower elevation than the Central Upland (part of the Piedmont Upland) and the Highland, part of the Appalachian Mountains, about 20 miles to the east.[3] Yet this valley is composed of a succession of ridges and minor valleys—the main ridges, crossing the county in a northeast and southwest course, conforming to the strike of the geologic formations.

The larger ridges exhibit a very rough and mountainous topography. Taylor Ridge rises to an elevation of over 1,400 feet above sea level and over 500 feet above the adjacent valley floors. The

[1] The field work for this survey was done while the Division was a part of the Bureau of Chemistry and Soils.

[2] The Tennessee Valley Authority also cooperated by supplying a part of the funds and materials used in this survey.

[3] LA FORGE, LAURENCE, COOKE, WYTHE, KEITH, ARTHUR, and CAMPBELL, MARCUS R. PHYSICAL GEOGRAPHY OF GEORGIA. Ga. Geol. Survey Bul. 42, 189 pp., illus. 1925.

lowest elevation, somewhat under 700 feet, is where South Chickamauga Creek crosses the Georgia-Tennessee State line.[4]

The geologic formations[5] of the valley are less resistant to weathering than the thick sandstone and conglomerate beds capping Lookout Mountain or the crystalline rocks of the Central Upland. These formations vary considerably within the boundaries of Catoosa County. This differential weathering is evidenced by six distinct physiographic belts, which cross the county in a northeast-southwest direction. In the extreme western part is (1) the valley traversed by West Chickamauga Creek, locally called Crawfish Valley. Bordering this valley on the east is (2) Boynton Ridge, which is immediately west of (3) Peavine Valley. This valley follows the course

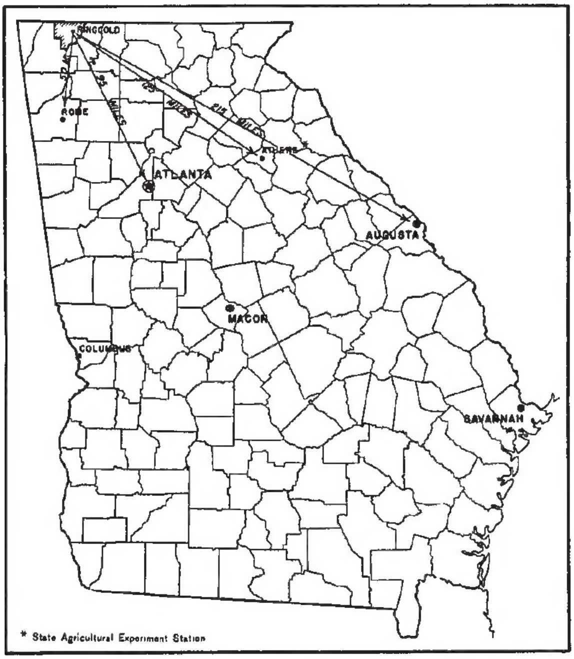

FIGURE 1.—Sketch map showing location of Catoosa County, Ga.

of Peavine Creek and is flanked on the east by the broad Peavine Ridge. Just east of the ridge is (4) a valley following the course of Little Chickamauga and South Chickamauga Creeks, almost bisecting the county. This valley abuts the lower slopes of (5) Taylor Ridge on the south and White Oak Mountain on the north of Ringgold. (6) Eastward to the Catoosa-Whitfield County line is a succession of smaller ridges and valleys.

Crawfish Valley, with an extent of about 30 square miles, has an undulating to gently rolling surface, broken more or less by comparatively small ridges. Chickamauga limestone is the dominant formation. Knox dolomite or interstratified sandstone and shale formations cap the ridges.

[4] Elevations given are taken from the Georgia-Tennessee Ringgold Sheet, U. S. Geological Survey.

[5] Names of geologic formations used in this section are taken from the following publication: SMITH, RICHARD W. SHALES AND BRICK CLAYS OF GEORGIA. Ga. Geol. Survey Bul. 45, p. 67. 1931.

Boynton Ridge, which rises over 200 feet above the adjacent valley floors, is capped by rather thick beds of either chert (forming the upper part of the Knox dolomite formation) or interstratified sandstone and shale, which withstood weathering, whereas calcareous shale, with interstratified beds of limestone (Conasauga shale and limestone), the dominant formation of Peavine Valley, was more rapidly decomposed and disintegrated. The surface of Peavine Valley is broken considerably by numerous small shallow stream valleys and low ridges. Boynton Ridge covers an area of about 8 square miles, and Peavine Valley covers an area of about 10 square miles.

Peavine Ridge covers about 33 square miles and is capped with a thick bed of chert (Knox dolomite). Its highest elevation is more than 1,200 feet above sea level and is from 200 to 400 feet above the contiguous valley floors on the east and west. The natural resistance of these chert beds to weathering has preserved this ridge, so that South Chickamauga Creek alone has cut across it. Numerous small branches, however, have dissected it to a very marked degree, and its surface is broken by many small sharp ridges separated by deep narrow valleys.

The valley traversed by Little Chickamauga and South Chickamauga Creeks is underlain by Chickamauga limestone. The elevation of this valley ranges from less than 800 feet in the flood plains to 1,000 feet on the tops of the low ridges. About 17 square miles are included in the valley.

Taylor Ridge and White Oak Mountain are capped with comparatively thick beds of sandstone interstratified with thin beds of shale (Red Mountain formation of Silurian series). Because of its thickness, together with its insoluble character, this formation has shown the greatest resistance of any in the county to degradational processes. This topographic division covers about 16 square miles.

The succession of small ridges and valleys covering the eastern third of the county occupies about 55 square miles, and the elevations range from 1,100 feet on Sand Mountain to less than 800 feet where Hurricane Creek crosses the Georgia-Tennessee State line. The highest ridges are capped with rather thick beds of sandstone interstratified with thin layers of shale, whereas other associated ridges are covered with chert. Between the ridges are undulating to gently rolling valley floors, which are cut by an intricate system of small intermittent stream valleys. Here, thick upturned beds of shale interstratified with thin beds of sandstone (Rome formation of the Cambrian series) predominate. The soft shale has been conducive to comparatively rapid stream cutting.

The county lies entirely within the drainage basin of the Tennessee River. The tributary streams flow northward and northwestward. The eastern part of the county drains into East Chickamauga Creek, the south-central part into Little Chickamauga Creek, the north-central part into South Chickamauga Creek, and the western part into Peavine and West Chickamauga Creeks.

All the creeks and many of the branches are perennial and provide potable water for the farm livestock. In places where there are no perennial streams, large excavations, commonly known as stock ponds, are made to catch rain water for cattle and hogs. The flood plains along streams are narrow, averaging less than one-fourth of a mile wide along the principal streams. The alluvial land is from 4 to 10

feet above the normal stream levels. A well-developed river terrace occurs at elevations of 5 to 15 feet above the flood plains, and remnants of another terrace from 20 to 40 feet higher.

Most of the water supply on the chert ridges comes from cisterns, and elsewhere it is obtained from shallow wells or springs. During periods of drought, water is, in places, transported for both the family and livestock.

Catoosa County was organized in 1853, but permanent settlement began, in Peavine Valley, in 1832. This county was formed from parts of Whitfield and Walker Counties and was named for Catoosa, a Cherokee Indian chief. The town of Ringgold was incorporated in 1847.

The first settlers were from Coweta County, Ga., and east Tennessee; but a little later many came from North Carolina and South Carolina.

The 1930 census reports a total population of 9,421, all classed as rural, of whom 5,126 are classed as rural-farm and 4,295 as rural-nonfarm. Of the population, 8,940 are native-born whites and 436 are Negroes. The density of population is greatest in the west quarter of the county, where many of the residents have their work or business in Chattanooga, Tenn.; it is least in the east quarter, where erosion has been most serious and the land is least productive. The average density of population for the county as a whole is 55.7 persons a square mile.

Ringgold, the county seat, with a population of 684, is the largest town and the principal shipping point. It is connected by the Nashville, Chattanooga & St. Louis Railway and United States Highways Nos. 41 and 76 with Atlanta, Ga., and Chattanooga, Tenn. United States Highway No. 27 passes through Fort Oglethorpe. Distributing points of less importance are Keith, Graysville, Wood Station, and Boynton.

This county is well provided with transportation facilities. In addition to the railroad and two paved Federal highways, there are several paved highways and many graveled roads. All homes are within a few miles of an improved road. The productivity of the soil and the type of farming are expressed, to no small degree, by road conditions.

Among the nonagricultural enterprises are a small planing mill at Ringgold, about six portable sawmills, and several small quarries, where chert gravel is obtained for roads.

CLIMATE

The climate of Catoosa County is continental and is favorable to agriculture. The mild winters are suitable for fall-sown oats, wheat, and rye, as well as vetches, crimson clover, Austrian Winter peas, and other grazing crops. Turnips, cabbage, collards, lettuce, beets, onions, and radishes grow successfully during the winter. The average frost-free season of 212 days, as recorded by the Weather Bureau station at Chattanooga, Tenn., extends from March 30 to October 28. This is a suitable growing season for cotton on Clarksville cherty silt loam and other well-aerated soils. The heavy and poorly drained soils warm too late in spring for cotton to mature before infestation by the boll weevil. On the ridges the temperature averages a little lower in both summer and winter and the growing season is somewhat shorter than at Chattanooga.

Local differences in the frost-free period are due to topographic

positions in respect to air drainage. Tops of ridges and upper slopes escape the killing frosts that occur frequently in the valleys and on lower slopes where locations are favorable for the accumulation of cold air. Occasionally, however, heavy fogs blanket the valleys and lower slopes and prevent the killing frosts that otherwise would occur.

The mean annual precipitation is 51.61 inches. Normally the rainfall is sufficient and is well distributed throughout the growing season. It is heavy in the spring and summer, when crops demand the most moisture. It is lightest in the fall, thus favoring ripening and harvesting. Records of the Weather Bureau station at Chattanooga, Tenn., show that during the period 1897–1931 excessively wet growing seasons occurred six times, when the total precipitation for May, June, and July, which usually is 12.20 inches, exceeded 18 inches; and severe droughts occurred six times, when the precipitation for these months was less than 7 inches.

Because of inadequate drainage and consequent saturation, some soils, particularly the Colbert and the heavier textured Apison soils, remain very cold until late in the spring. This condition greatly retards the planting and germination of seeds.

As a rule, moderate westerly winds prevail, although occasionally, during the spring or fall, strong winds accompany local thunderstorms and sometimes reach destructive velocities. At times hail accompanies the storms and damages cotton, corn, and other crops.

Table 1, compiled from the records of the United States Weather Bureau, gives the normal monthly, seasonal, and annual temperature and precipitation at Chattanooga, Tenn.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Chattanooga, Hamilton County, Tenn.*

[Elevation, 808 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1904)	Total amount for the wettest year (1929)	Snow, average depth
	°F.	*°F.*	*°F.*	*Inches*	*Inches*	*Inches*	*Inches*
December	43.3	75	3	5.13	4.12	2.89	1.5
January	41.2	76	−7	5.26	2.58	5.72	2.5
February	44.1	79	−10	4.88	2.08	5.83	2.2
Winter	42.9	79	−10	15.27	8.78	14.44	6.2
March	51.2	89	2	5.78	5.81	10.80	.8
April	60.3	92	25	4.85	1.67	6.70	.2
May	68.8	95	37	3.79	2.76	12.00	.0
Spring	60.1	95	2	14.42	10.24	29.50	1.0
June	75.4	100	39	4.16	1.92	4.39	.0
July	78.4	104	56	4.25	2.09	3.21	.0
August	77.5	101	54	4.03	5.03	.45	.0
Summer	77.1	104	39	12.44	9.04	8.05	.0
September	72.2	104	38	3.11	1.07	5.66	.0
October	61.9	92	26	3.01	.46	3.12	(1)
November	50.4	81	11	3.36	3.09	11.60	.3
Fall	61.5	104	11	9.48	4.62	20.38	.3
Year	60.4	104	−10	51.61	32.68	72.37	7.5

[1] Trace.

AGRICULTURE

Before the coming of the white settlers, Cherokee squaws grew corn and beans for subsistence. Without transportation facilities or nearby markets, the earliest agriculture was governed by the necessity of the pioneers to provide subsistence. Because of its wide range of uses and more or less natural adaptability to soils and other environmental conditions, corn was the most important crop. Other important crops were wheat, oats, and hay; and flax, hemp, sweetpotatoes, tobacco, and cotton were produced on small areas. All farmers pastured cattle and hogs in the large forested areas of the open range, and some kept sheep.

Construction of the railroad through Ringgold in 1852, giving the county, for the first time, easy access to the Atlanta market, stimulated agricultural prices. This led to a rapid occupation of the land and a corresponding development of agriculture.

Tables 2, 3, and 4, compiled from the reports of the United States census, give acreages of the principal crops, numbers of livestock on farms, and value of agricultural products, by classes, for various census years.

TABLE 2.—*Acreage of principal crops in Catoosa County, Ga., in stated years*

Crop	1879	1889	1899	1909	1919	1929	1934
	Acres	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*
Corn for grain	10, 783	10, 480	13, 609	9, 907	12, 112	7, 871	10, 840
Wheat	5, 911	1, 424	4, 560	1, 055	1, 388	7	85
Oats	1, 503	2, 894	419	993	161	17	34
Dry peas	-----	-----	205	39	59	[1] 133	[1] 708
Sweetpotatoes	140	233	279	657	553	490	593
Market vegetables	-----	-----	-----	517	484	996	1, 501
Cotton	367	3, 351	1, 422	4, 002	6, 797	6, 599	5, 528
All hay and forage	[2] 459	[2] 3, 137	2, 239	3, 701	7, 037	4, 388	6, 802
All tame or cultivated grasses	-----	-----	1, 515	2, 620	2, 862	1, 839	1, 026
Clover alone	-----	-----	129	-----	-----	329	718
Alfalfa	-----	-----	-----	-----	-----	23	73
Other cultivated grasses	-----	-----	1, 386	-----	-----	1, 487	235
Wild grasses	-----	-----	350	945	1, 331	1, 757	[3] 4, 224
Grains cut green	-----	-----	163	123	166	25	272
Legumes cut for hay	-----	-----	-----	-----	1, 364	281	781
Silage crops	-----	-----	-----	-----	122	94	-----
Coarse forage	-----	-----	211	13	1, 192	231	[4] 118
Sorghums cut for silage, hay, and fodder	-----	-----	-----	-----	-----	161	381
Strawberries	-----	-----	332	138	33	88	80
	Trees	*Trees*	*Trees*	*Trees*	*Trees*	*Trees*	*Trees*
Apples [5]	-----	16, 208	39, 068	25, 371	21, 651	9, 060	10, 325
Peaches [5]	-----	31, 080	52, 031	69, 025	14, 849	16, 258	11, 990

[1] Mostly cowpeas, also includes velvetbeans in 1934.
[2] Hay only.
[3] Includes some tame grass.
[4] Corn for purposes other than grain.
[5] Apple and peach trees are for the years 1890, 1900, 1930, and 1935.

TABLE 3.—*Number and value of livestock on farms in Catoosa County, Ga., in stated years*

Livestock	1920		1930		1935 [1]
	Number	*Value*	*Number*	*Value*	*Number*
Horses	885	$98, 876	432	$27, 124	242
Mules	1, 295	195, 679	1, 308	129, 398	1, 620
Cattle	3, 763	169, 886	3, 504	148, 108	4, 210
Sheep	235	1, 761	54	236	123
Goats	702	1, 499	22	54	85
Swine	3, 068	42, 186	1, 208	13, 444	1, 564
Chickens	38, 884	[2] 36, 983	31, 277	22, 519	40, 873
Bees (hives)	705	1, 417	241	639	-----

[1] Value not reported. [2] Includes value of 797 other poultry.

TABLE 4.—*Value of agricultural products, by classes, in Catoosa County, Ga., in stated years*

Product	1909	1919	1929
Cereals	$108,792	$380,174	$139,350
Other grains and seeds	445	3,321	1,660
Hay and forage	62,490	218,732	58,177
Vegetables (including potatoes and sweetpotatoes)	82,594	193,065	176,384
Fruits and nuts	39,562	25,496	18,061
All other field crops	137,057	765,172	210,424
Farm garden vegetables (excluding potatoes and sweetpotatoes) for home use only			54,558
Forest products cut on farms, for home use and for sale			30,674
Livestock products:			
Dairy products sold	20,911	91,155	122,804
Poultry and eggs produced	33,439	103,293	85,160
Wool produced	388	261	100
Honey and wax produced	260	1,236	[1] 157
Total	485,938	1,781,905	897,509

[1] Honey only.

Significant features brought out by these tables are the abrupt decline in acreages devoted to small grains and the increase in acreages devoted to vegetables between 1919 and 1934, and the sudden rise in cotton acreages between 1879 and 1889. From 1879 to 1909 the acreage in corn consistently exceeded that in all other crops combined. The decline in the number of horses and hogs and the increase in the number of mules, the comparative high value of agricultural products in 1919, when prices were at a maximum, and the increased value of such products between 1909 and 1929 are noteworthy.

The principal crops of Catoosa County, in order of acreage, are corn, cotton, hay, and truck. Less important crops are wheat, oats, rye, sorghum, and cowpeas. Some fruit is grown for local markets and home use, but it is not an important crop. Apples, peaches, and pears lead, and strawberries are the principal berry fruit.

Ranked as sources of income, the county agent puts cotton first, dairy and beef products second, truck crops third, and corn fourth.

The present economic structure of fully one-half of Catoosa County depends on growing cotton as a cash crop. About 70 percent of the Second-class and Third-class soils are well adapted to the growing of cotton, because of their perviousness, friability, and relative earliness in the spring. If the land is well fertilized, cotton fruits heavily and generally matures before it is severely damaged by the boll weevil. Some of the best soils for cotton are low in organic matter and plant nutrients but are easy to till. In 1934, according to the 1935 census, 3,139 bales of cotton were produced on 5,528 acres.

Corn is grown on all types of cropland but succeeds best on the soils of the flood plains. It is used to feed the work animals, fatten hogs, and supply meal for the home. The supply grown is insufficient for local needs. It is a common practice to pull the leaves for fodder from most of the corn grown for grain. In 1934, 10,840 acres were planted and the production was 168,282 bushels. Marlboro, Prolific, Hickory King, and Paymaster are popular varieties.

Hay crops, as well as cultivated pastures, consist mainly of Korean lespedeza. Cowpeas, soybeans, velvetbeans, oats, rye, and corn fodder are important as cultivated hay and forage. The uncultivated hays consist largely of a volunteer growth of mixed lespedeza, Bermuda and Johnson grasses, and redtop.

The raising of livestock is dependent largely on general farming, in which feed for the livestock is particularly stressed. There are about 40 dairies in the county. The dairy herds are composed mainly of grade Jersey cattle. Most of the cows are grades, but the sires are purebred. Whole milk is sold in Chattanooga, Tenn., through a farmers' cooperative dairy organization. On the greater number of farms a few dairy cattle are kept for family use.

Most farmers have some cattle that are sold for beef. These are mainly of the dairy type, but there are some beef grades, of which Hereford is the most common. There is a growing interest in feeding beef cattle for market. The cattle are shipped in from western points in the fall and are marketed in the spring. Hereford and Shorthorn are the leading breeds.

For work animals the farmers generally breed the working mares to a good quality jack, weighing from 900 to 1,000 pounds, and raise enough mules for their own use. Duroc-Jersey and Poland China are the more important breeds of hogs, but little interest is taken in the production of pork. Most farmers have flocks of 15 to 100 chickens. Rhode Island Reds, Barred Plymouth Rocks, and White Leghorns are the more common breeds.

According to the county agent, in 1932 there were about 7,000 acres of land in cotton in Catoosa County; but this was gradually reduced until about 3,500 acres were devoted to cotton in 1939. Instead of growing cotton, farmers became more interested in livestock. This necessitated more land in lespedeza and other cover crops, which improve and protect the soil from erosion.

The amount expended for fertilizer increased from $1,076 in 1879 to $51,170 in 1929. This expenditure was reported by 81.9 percent of the farms and averaged $64.12 per farm reporting. The rising demand for fertilizer is probably due to the increased acreages in cotton and truck crops. Complete commercial fertilizers are used almost exclusively in all parts of the county. A 3–9–3 [6] mixture is most commonly used on land for cotton; a 2–10–2 on land for corn and wheat; a 5–7–5 and 4–7–6 on land for potatoes, beans, peppers, squash, eggplant, lettuce, strawberries, cantaloups, watermelons, and other truck crops; and a 0–16–0, together with lime, for hay. The better farmers use a 4–10–4 or 4–12–4 mixture on land devoted to cotton, and a 2–10–2 or 0–16–0 on land devoted to corn. Ground limestone is applied to the grassland.

Most of the farm laborers are native whites, and a few Negroes are employed. The demand for labor, which arises during planting, harvesting, or at other times when additional help is needed, is met on most farms by an exchange of labor among neighbors. According to the 1930 census, 197 farms reported a total expenditure of $22,267, or $113.03 per farm, for labor in 1929.

The proportion of the total area of the county in farms reached a maximum in 1890, after which time it fell to 71.9 percent in 1930. In 1935, however, it rose to 78.3 percent, or 84,741 acres. The average size of farms, however, has decreased from 157 acres in 1880 to 71.7 acres in 1935. From 1880 until 1920 the acreage of improved land gradually increased, but it decreased somewhat in 1930 and increased again in 1935 to 50,410 acres.

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[6] Percentages, respectively, of nitrogen, phosphoric acid, and potash.

Of the 1,182 farms reported by the 1935 census, 487 were operated by owners, 84 by part owners, 1 by a manager, and 610 by tenants. Most of the tenants were share tenants, 273 were croppers, and a few were cash tenants. Under the share system of rental, the owner furnishes the land and one-fourth of the commercial fertilizer and receives one-fourth of the cotton and one-third of all other crops. When the tenant is a cropper the owner furnishes work animals, feed, equipment, and one-half of the commercial fertilizer and receives one-half of all crops. As the cash renter pays cash, he retains the entire crop.

According to the United States census for 1935, 38,537 acres of the 108,160 acres of land in Catoosa County was classed as cropland, including 12,494 acres of idle land; 10,673 acres was classed as pasture; and 30,846 acres was classed as woodland.

SOIL-SURVEY METHODS AND DEFINITIONS

Soil surveying consists of the examination, classification, and mapping of soils in the field.

The soils are examined systematically in many locations. Test pits are dug, borings are made, and exposures, such as those in road and railroad cuts are studied. Each excavation exposes a series of distinct soil layers or horizons, called, collectively, the soil profile. Each horizon of the soil, as well as the parent material beneath the soil, is studied in detail; and the color, structure, porosity, consistence, texture, and content of organic matter, roots, gravel, and stone, are noted. The reaction of the soil [7] and its content of lime and salts are determined by simple tests. Drainage, both internal and external, and other external features, such as relief, or lay of the land, are taken into consideration, and the interrelations of the soils and vegetation are studied.

The soils are classified according to their characteristics, both internal and external, with special emphasis on those features influencing the adaptation of the land for the growing of crop plants, grasses, and trees. On the basis of these characteristics, soils are grouped into classification units. The three principal ones are (1) series, (2) type, and (3) phase. Areas of land such as coastal beach or bare rocky mountainsides that have no true soil are called (4) miscellaneous land types.

The most important group is the series, which includes soils having the same genetic horizons similar in their important characteristics and arrangement in the soil profile and developed from a particular type of parent material. Thus, the series includes soils having essentially the same color, structure, and other important internal characteristics and the same natural drainage conditions and range in relief. The texture of the upper part of the soil, including that commonly plowed, may vary within a series. The soil series are given names of places or geographic features near which they were first found. Thus, Clarksville, Fullerton, Pope, and Cumberland are names of important soil series in this county.

[7] The reaction of the soil is its degree of acidity or alkalinity, expressed mathematically as the pH value. A pH value of 7 indicates precise neutrality; higher values indicate alkalinity; and lower values, acidity.

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Within a soil series are one or more soil types, defined according to the texture of the upper part of the soil. Thus, the class name of the soil texture, such as sand, loamy sand, sandy loam, loam, silt loam, clay loam, silty clay loam, and clay, is added to the series name to give the complete name of the soil type. For example, Pope fine sandy loam and Pope silt loam are soil types within the Pope series. Except for the texture of the surface soil, these soil types have approximately the same internal and external characteristics. The soil type is the principal unit of mapping, and because of its specific character it is usually the soil unit to which agronomic data are definitely related.

A phase of a soil type is a variation within the type, which differs from the type in some minor soil characteristic that may have practical significance. Differences in relief, stoniness, and the degree of accelerated erosion are frequently shown as phases. For example, within the normal range of relief for a soil type, certain areas may be adapted to the use of machinery and the growth of cultivated crops and others may not. Even though there may be no important difference in the soil itself or in its capability for the growth of native vegetation throughout the range in relief, there may be important differences in respect to the growth of cultivated plants. In such an instance the more sloping parts of the soil type may be segregated on the map as a sloping or a hilly phase. Similarly, soils having differences in stoniness may be mapped as phases, even though these differences are not reflected in the character of the soil or in the growth of native plants.

The soil surveyor makes a map of the county or area, showing the location of each of the soil types, phases, and miscellaneous land types, in relation to roads, houses, streams, lakes, section and township lines, and other local cultural and natural features of the landscape.

SOILS

The farmers of Catoosa County are guided, to a marked degree, by the adaptation of certain crops and types of farming to the soils. Soil charactertistics and conditions, such as texture, color, consistence, structure, content and quality of organic matter, inherent plant nutrients, drainage, reaction, relief, moisture-receiving and moisture-holding capacities, degree of slope, erosion, stoniness, and workability, bear a close relationship to productivity. For instance, the brown color connotes good drainage; the gray, poor drainage; and the red, a comparatively high content of iron. Textures range from loamy fine sand to silty clay loam, with silt loam textures extending over about 93 square miles of the 169 of the county. Fine sandy loams and very fine sandy loams cover about 59 square miles, and silty clay loams about 17. Of the land of the county, 58 square miles, or 34.3 percent, are classed as Second-class soils, 36 square miles, or 21.3 percent, as Third-class soils; 33 square miles, or 19.5 percent, as Fourth-class soils; and 42 square miles, or 24.9 percent, as Fifth-class soils. Of the 75 square miles of nonarable land, 59 percent is so because of steepness of slope, together with stoniness; 24.5 percent because of erosion; 10 percent because of poor drainage; and 6.5 percent because of stoniness. There are about 32 square miles

of land in stream flood plains, where the surface is almost level. The surface slope for about 52 square miles of land ranges from 2.5 to 7.5 percent, for 35 square miles from 7.5 to 15 percent, for 30 square miles from 15 to 30 percent, and for 20 square miles from 30 to 60 percent or more. Consistence ranges from incoherent or mellow pervious surface soils and friable subsoils to compact surface soils and heavy impervious subsoils.

The county agent states the highest farm income and the best improvements are on the dominantly heavy silt loams with heavy clay subsoils west of Boynton Ridge. On these lands, farmers produce corn, small grains, and hay in conjunction with dairying or some other livestock industry. Between Boynton Ridge and Peavine Ridge, about one-half of the soils are light silt loams, fine sandy loams, or very fine sandy loams, with pervious subsoils, and the other half are heavy silt loams with heavy subsoils. This section ranks second in the county in farm incomes and improvements. The light-textured soils are naturally adapted to the early maturing of cotton as well as to trucking. The heavier soils are devoted, for the most part, to general farming in conjunction with livestock raising. On Peavine Ridge and eastward to Taylor Ridge and White Oak Mountain, the soils are dominantly light-textured well-drained silt loams, cherty silt loams, fine sandy loams, and very fine sandy loams, that are particularly suited for growing cotton and truck crops. The farm incomes and improvements for this area rank third in the county. The growing of cotton, together with some truck crops, is the dominant type of farming.

The rest of the county is less productive and produces lower average farm incomes than the sections just mentioned, although many individual farmers, having well or intermediately drained lands on stream bottoms and terraces or in the uplands, are among the most progressive. In the southeast and east-central parts of the county, where the underlying shale formation is within 2 feet of the surface and where most of the surface soil has eroded, are the lowest farm incomes and the least improvements.

On most of the high ridges, steep slopes and stoniness inhibit cultivation, but some of the higher crests and slopes include patches of very productive well-drained, maroon-colored soils, which are used for trucking.

This county is in a humid region, where the soils are low in organic matter, because they were formed under a dense forest cover, which was unfavorable to the accumulation of much organic matter. Throughout the county geologic formations strongly influence the soils and the materials from which they are derived. For instance, in the upland, the 13 square miles of cropland best adapted to general farming and pasture in conjunction with livestock raising are from limestone; the 21 square miles best suited to cotton and truck are from chert, ferruginous sandstone, or interstratified sandstone and shale with the sandstone predominating; and the 2 square miles from interstratified shale and sandstone, with the shale predominating, are the least productive. The character of soil materials is also strongly reflected in the productivity of the soils on stream terraces and flood plains. About 6 square miles of these soils are associated with and developed from soils and materials that overlie acid shale. These soils are obviously less productive than about 45 square miles of

similarly situated soils where the soils are developed from soils and materials over limestone or a mixture of limestone, sandstone, and shale.

The natural adaptations of crops to soils, the crops grown, and the types of agriculture practiced form a basis for three general groups of lands, namely, cropland, pasture, and forest. The first group comprises the Second-class and Third-class soils—all the land in the county that is suitable for the production of crops; the second includes Fourth-class soils, which are too stony, eroded, sloping, or broken for cultivation but have texture and consistence adapted to the growing of pasture grasses; and the third includes the Fifth-class soils—all the land not listed in the other groups. The county does not contain First-class soils, as they have been defined for the entire Tennessee Valley, in areas large enough to show on the soil map.

In the following pages the soils of Catoosa County are described, and their agricultural relationships are discussed; their location and distribution are shown on the accompanying soil map; and table 5 gives their acreage and proportionate extent.

TABLE 5.—*Acreage and proportionate extent of the soils mapped in Catoosa County, Ga.*

Type of soil	Acres	Per-cent	Type of soil	Acres	Per-cent
Clarksville cherty silt loam, smooth phase	6,272	5.8	Fullerton cherty silt loam, eroded phase	1,792	1.7
Greendale cherty silt loam	2,112	1.9	Apison very fine sandy loam, eroded slope phase	4,288	4.0
Fullerton silt loam	832	.8	Dandridge silt loam	320	0.3
Talbott silt loam	960	.9	Colbert silty clay loam	6,720	6.2
Tellico fine sandy loam	832	.8	Colbert silty clay loam, slope phase	960	.9
Apison very fine sandy loam, deep phase	1,472	1.4	Colbert silt loam, slope phase	128	.1
Sequatchie fine sandy loam	2,944	2.7	Rolling stony land (Colbert soil material)	2,048	1.9
Waynesboro very fine sandy loam	1,792	1.7	Melvin silty clay loam	2,816	2.6
Cumberland very fine sandy loam	1,472	1.4	Atkins silt loam	1,856	1.7
Allen very fine sandy loam	1,216	1.1	Clarksville cherty silt loam, hill phase	11,968	11.1
Wolftever silt loam	2,176	2.0	Clarksville cherty silt loam, steep phase	1,920	1.8
Pope silt loam	1,792	1.7	Muskingum stony fine sandy loam	10,816	10.0
Pope fine sandy loam	2,176	2.0	Hanceville stony fine sandy loam	1,664	1.5
Roane silt loam	2,880	2.6	Rough stony land (Muskingum soil material)	576	.5
Philo silt loam	8,256	7.6			
Clarksville cherty silt loam	7,808	7.2			
Apison very fine sandy loam	5,184	4.8			
Colbert silt loam	6,976	6.4			
Waynesboro very fine sandy loam, eroded phase	2,304	2.1			
Jefferson fine sandy loam	832	.8	Total	108,160	100.0

SECOND-CLASS SOILS

Second-class soils have fair to good potential productiveness and mellow surface soils. The consistence and structure of the soils favor tilth, drainage, and deep penetration of roots. With the exception of the steeper slopes of Tellico fine sandy loam, the relief is suitable for the use of all kinds of farm machinery, and comparatively little erosion takes place. The soil is comparatively free from stones that interfere with cultivation. Of the soils of the uplands, Talbott silt loam and Tellico fine sandy loam have the highest contents of available plant nutrients. The former soil has a heavy subsoil and poor internal drainage. It is developed from the weathered products of limestone that contains thin beds of calcareous shale. The latter soil, together with all other soils of the uplands of this class, is pervious and has

good drainage throughout. It is more fertile and has a redder subsoil than Fullerton silt loam, which, in turn, is more fertile and has more red in the subsoil than Clarksville cherty silt loam, smooth phase. Tellico fine sandy loam is developed from disintegrated red sandstone, and Fullerton silt loam and Clarksville cherty silt loam, smooth phase, are developed from weathered beds of chert that contain thin beds of shale.

Of the 58 square miles covered by this group of soils, 23 square miles are on the terraces and alluvial fans, 19 square miles are on the flood plains, and 16 square miles are on the uplands.

Greendale cherty silt loam, Apison very fine sandy loam, deep phase, Allen very fine sandy loam, and Wolftever silt loam occur on alluvial fans, colluvial accumulations along the bases of slopes, and old stream-terrace remnants. The first of the soils has developed from materials washed from soils underlain by chert beds with a small addition of shale; the second and third from a mixture of materials washed from soils underlain by interstratified sandstone and shale, limestone, and chert beds; and the fourth from materials washed from soils underlain mainly by noncalcareous and calcareous beds of shale containing thin beds of limestone. The latter soil differs from the other three soils in its heavy subsoil and restricted internal drainage. Underlying formations of interstratified sandstone and shale or limestone lie from 2 to 10 feet or more beneath the surface of Allen very fine sandy loam, but interstratified sandstone and shale beds are only from 1 to 4 feet beneath the surface of Apison very fine sandy loam, deep phase.

Waynesboro very fine sandy loam and Cumberland very fine sandy loam are on high stream terraces, and Sequatchie fine sandy loam is on low stream terraces. These soils are developed from materials washed from soils overlying interstratified sandstone and shale, limestone, and chert beds. The first-mentioned soil is redder, is more weathered and eroded, and has more soil development than the other two. Pope silt loam, Pope fine sandy loam, Roane silt loam, and Philo silt loam occur on the flood plains of streams. The Pope and Roane soils have good drainage, but the soil materials of the former comprise wash from soils underlain by interstratified sandstone and shale, limestone, and chert beds, whereas the soil material of the latter represent wash from soils underlain by chert beds that include thin beds of shale. Philo silt loam has been derived from the same soil materials as Pope silt loam, but it has somewhat impeded internal drainage, whereas Pope silt loam is well drained throughout.

Clarksville cherty silt loam, smooth phase.—In a virgin condition, the 3-inch surface layer of Clarksville cherty silt loam, smooth phase, consists of gray cherty silt loam, together with some loosely combined organic matter, which quickly disappears under cultivation. Below this and continuing to a depth of about 14 inches is light-gray or light yellowish-gray cherty silt loam. This layer rests on yellowish-gray moderately friable and brittle cherty silty clay loam. Throughout the surface soil and subsoil and scattered over the surface are numerous small irregular-shaped fragments of angular chert ranging from ¼ to 6 inches in diameter, which comprise more than one-half of the soil mass. Below a depth ranging from 20 to 30 inches there occurs what may be termed a hardpan or bed of chert with a matrix of silt and collodial clay acting as a cement. Beds

of chert fragments lie from 5 to 20 feet or more below the surface. Areas where the chert fragments on the surface are so numerous as to interfere materially with tillage are indicated on the map by symbols. One such area is southwest of Pleasant Grove Church. To a depth of 36 inches the material shows medium acidity, but below this it is strongly acid.

The total area of Clarksville cherty silt loam, smooth phase, is not large. Most of this soil occurs on 2.5 to 7.5 percent slopes of ridges throughout the Peavine Ridge section. Smaller areas are on ridges in almost all parts of the county. This soil is naturally well drained, and absorption of rain water is fair, but the moisture-conserving capacity is low. The latter feature could be very much improved, however, by the incorporation of green manures.

About 90 percent of Clarksville cherty silt loam, smooth phase, is tilled. Of this 40 percent is used for cotton, 20 percent for corn, 20 percent for truck, 5 percent for grain, and 10 percent for hay. Of the uncultivated land, about two-thirds is covered with hardwoods and some pine, and the rest is used for pasture or is in old fields grown over with brush.

Cotton and truck crops are the principal cash crops grown on this land, with corn and hay as subsistence crops. Yields of cotton average about one-half bale an acre, corn 16 bushels, and hay three-fifths of a ton.

The prevailing practice for this soil is to grow, in the course of 5 years, cotton or corn twice, lespedeza twice, and corn once.

Land for cotton is generally given an acreage application of 200 to 250 pounds of 3-9-3, 4-10-4, or 4-8-4 fertilizer; land for corn, when fertilized, receives from 100 to 200 pounds of 2-10-2; and land for wheat, from 100 to 200 pounds of 5-7-5 or 3-9-3. Corn and wheat, and in some instances cotton, receive a side dressing ranging from 75 to 150 pounds per acre of nitrate of soda. Land devoted to sweetpotatoes and truck crops receives from 400 to 1,000 pounds of 4-7-6 per acre. Land on which hay crops are grown generally is not fertilized, but some of the best farmers have obtained excellent results by liming the land and applying superphosphate.

This soil is fairly easy to till but is deficient in organic matter. The incorporation of a good supply of organic matter would improve the tilth, increase the absorptive capacity, and cause the soil to retain moisture for the crops.

As a constructive step in increasing and maintaining the producing quality of this land, it is recommended that a rotation be practiced in which cotton is followed by Austrian Winter peas, hairy vetch, or crimson clover. The peas are preferable for the first rotation, because they will grow under a lower state of soil fertility. After plowing the peas under in the spring, corn is interplanted with cowpeas. This is followed by winter grain, and the grain, in turn, by Korean lespedeza, which should be left for 2 years. A truck crop may be substituted for cotton.

Although this is about the least erodible upland soil, owing to its comparative smoothness, terracing and winter cover crops are necessary protections.

Greendale cherty silt loam.—Greendale cherty silt loam represents a soil condition where materials from Clarksville cherty silt loam and Fullerton silt loam have been washed or have rolled down and

collected at the bases of slopes. The 8-inch surface layer of this soil is light brownish-gray friable silt loam containing a small quantity of organic matter and many angular cherty fragments ranging from ¼ to 6 inches in diameter. Underlying this layer is light brownish-gray silt loam, which continues to a depth ranging from 20 to more than 40 inches. Both surface soil and the subsoil are medium acid.

Included with Greendale cherty silt loam is about one-eighth of a square mile of Sequatchie gravelly loam, which occurs on a stream terrace near Burning Bush School, in the west-central part of the county. Its profile resembles that of Sequatchie fine sandy loam, except that there is a great deal of chert and sandstone gravel throughout. This soil, as mapped, also includes one-third of a square mile of cherty silt loam, which occurs on stream terraces and is well distributed over the central and western parts of the county. Its soil profile is comparable to that of Roane silt loam.

The total area of Greendale cherty silt loam is not large. The land is undulating to sloping, and the slopes average about 7 percent. Rain water soaks into this soil quickly, and the moisture-holding capacity is superior to that of Clarksville cherty silt loam, smooth phase.

About 80 percent of this land is cultivated, 10 percent is idle, 5 percent is in pasture, and 5 percent is in woodland. The proportions of soil allotted to various crops, the kinds and quantities of commercial fertilizer used, methods of treatment followed, and recommendations for improvement are essentially the same as for Clarksville cherty silt loam, smooth phase.

Fullerton silt loam.—The cultivated soil of Fullerton silt loam, to a depth of about 7 inches, consists of light grayish-brown friable pervious silt loam with some durable organic matter. Below this and continuing to a depth of about 14 inches is grayish-yellow or light brownish-gray highly leached friable silt loam, which grades downward into reddish-yellow friable silty clay loam. This is underlain, at a depth of about 23 inches, by reddish-brown or brownish-red friable silty clay loam or silty clay, which, at a depth of about 32 inches, rests on light-red brittle clay splotched with grayish yellow. The substratum, which lies at a depth of about 50 inches, consists of beds of broken chert interstratified with red heavy clay. Scattered over the surface and more or less mixed throughout the soil are a few chert fragments ranging from ¼ to 6 inches in diameter. The acidity of both surface soil and subsoil is about medium.

Fullerton silt loam is closely associated with Clarksville cherty silt loam but differs from it in its reddish-brown heavier subsoil, slightly higher content of organic matter in the surface layer, and somewhat higher moisture-retaining capacity.

This soil covers a very small total area. It occurs in long narrow bodies on the basal slopes of cherty ridges, mainly in the northeastern and east-central parts of the county. The average surface slope is about 6 percent. Drainage, both surface and internal, is good.

About 85 percent of Fullerton silt loam is cultivated, 5 percent is idle, and 10 percent is in woods consisting of hardwood and some pine trees. About the same proportion of land is used for the various crops, needs for soil amendments are similar, and yields are slightly better, compared with those features of Clarksville cherty silt loam, smooth phase.

Talbott silt loam.—Talbott silt loam resembles Fullerton silt

loam in its percentage of surface slope, but it has a better inherent supply of organic matter and a much heavier textured subsoil.

In cultivated fields the 8-inch surface soil of Talbott silt loam is grayish-brown friable mellow silt loam containing some organic matter. The subsoil is brownish-yellow friable silt loam with a slight red tinge. This soil horizon at a depth of about 12 inches grades into a layer, a few inches thick, of brownish-yellow silty clay loam with a red hue, that carries more or less manganese or ferruginous concretions. Beneath this is yellowish-red or yellowish-brown heavy silty clay that is very sticky when wet and is splotched with gray, yellow, and brown. This soil, at depths ranging from 4 to 7 feet, rests on limestone interstratified with thin beds of calcareous shale. Both the surface soil and the subsoil are medium to strongly acid, with little change to a depth within 6 to 10 inches of the limestone, where the soil material is neutral to slightly alkaline.

On steep slopes, where sheet erosion has been active, the surface soil has largely or entirely washed away in spots, whereas, along the bases of slopes, where surface wash has accumulated, the surface soil is as much as 12 inches thick in places. As mapped, Talbott silt loam includes many small areas of Colbert silt loam.

The total area of Talbott silt loam is not large. Most of the soil occupies undulating to gently rolling areas in the southwestern part of the county. Surface drainage is good, but internal drainage is impeded by the heavy subsoil, which does not allow so rapid percolation of rain water as the subsoils of Clarksville cherty silt loam and Fullerton silt loam. This feature augments the run-off and increases erosion accordingly.

About 90 percent of Talbott silt loam is cultivated, 5 percent is in permanent pasture, and 5 percent is in woodland supporting hardwood and pine. Of the cultivated land, 30 percent is devoted to corn, 10 percent to cotton, 3 percent to truck crops, 20 percent to grain, and 33 percent to hay. Corn gives an average yield of about 21 bushels an acre, cotton one-half bale, hay 1 ton, wheat 11 bushels, and oats 20 bushels. Methods of treatment and fertilization used are about the same as those described for Clarksville cherty silt loam, smooth phase.

Most of this land is low in organic matter and is subject to serious erosion. To help overcome these unfavorable features, a rotation is recommended in which corn, interplanted with cowpeas, follows a winter legume plowed under, and this is followed by lespedeza and grain for 2 years. Cornland should receive 200 pounds of 3–9–3 or 4–10–4 fertilizer at planting time, and from 100 to 200 pounds of nitrate of soda used as a side dressing. Fertilizers of higher analyses, such as 8–16–8 or 5–15–5, are usually cheaper and more efficient. Their use is increasing. For lespedeza, as a hay crop, from 1 to 2 tons of ground limestone and from 200 to 400 pounds of triple superphosphate, or its equivalent, should be applied to each acre. As a permanent pasture, a mixture of lespedeza, timothy or herd's-grass, Dallis grass, white clover, and alsike clover is recommended. For the control of erosion, terracing or strip cropping, and for steeper slopes a combination of these, should be effective.

Tellico fine sandy loam.—In cultivated fields the 6- to 10-inch surface soil of Tellico fine sandy loam is brown fine mellow sandy loam with a slight red tinge. The content of organic matter is fair.

Small fragments of ferruginous sandstone are numerous. The subsoil is yellowish-red mellow loam or fine sandy loam containing many small fragments of ferruginous sandstone. This layer, below a depth ranging from 2 to 7 feet, rests on gray calcareous sandstone. Field tests indicate medium acidity for the surface soil and the subsoil.

This soil occurs largely on the crests and higher slopes of Taylor Ridge and, to less extent, on White Oak Mountain and Sand Mountain. The crest areas, comprising about 20 percent of the total, have slopes averaging about 8 percent, and in the rest of the areas the slopes are about 25 percent. Surface and internal drainage are good, and the moisture-absorbing and moisture-holding capacities are among the best for the soils in this county. The perviousness of this soil enables it to absorb moisture quickly, so that erosion is not serious until the slopes exceed 10 percent. As the average slope of the land farmed, however, is around 20 percent, control of erosion is a very important problem.

About 25 percent of Tellico fine sandy loam is cultivated, 25 percent is idle, and the rest supports a growth of hardwood and some pine. Of the cultivated land about 50 percent is devoted to truck crops, 20 percent to cotton, 15 percent to corn, 3 percent to small grains, and 12 percent to hay. Methods of treatment are much like those followed on Clarksville cherty silt loam, smooth phase, but the yields, owing to a superior tilth and higher fertility, are perhaps 10 percent higher.

The same rotations are recommended for the improvement of this soil as for Clarksville cherty silt loam, smooth phase. On all land with slopes exceeding 10 percent, a combination of terraces with strip crops should be used to control erosion, and cultivation should not be attempted on slopes exceeding 20 percent.

Apison very fine sandy loam, deep phase.—To a depth of 5 to 8 inches, Apison very fine sandy loam, deep phase, under cultivation consists of light grayish-brown mellow very fine sandy loam with some organic matter well incorporated with the mineral soil. Underlying this is grayish-yellow leached very fine sandy loam, which, at a depth of about 15 inches, grades into reddish-brown firm friable very fine sandy clay with gray, brown, and yellow mottlings. This material breaks readily, under average moisture conditions, into buckshot-sized lumps, which afford a favorable structure for the penetration of roots. Between depths of about 26 and 32 inches is a shale formation. In places thin stratified beds of gravel or sand occur in the subsoil. Field examinations indicate medium acidity throughout the soil profile.

As mapped, Apison very fine sandy loam, deep phase, resembles Waynesboro very fine sandy loam in its association with Sequatchie fine sandy loam, as it occurs at higher levels in broad valleys and its materials show the effects of water assortment in the surface soil and subsoil. It differs from that soil in that the interstratified shale and sandstone lie within a depth ranging from 1 to 4 feet from the surface.

Included with this soil in mapping and more or less interspersed throughout all its areas are small bodies, totaling about one-half square mile, of a soil that retains 75 percent or more of its virgin surface soil. It has a 6- or 7-inch organic layer of brownish-gray very fine

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sandy loam. In other respects the soil profile is comparable to that of Apison very fine sandy loam.

The principal areas of Apison very fine sandy loam, deep phase, are southeast of Ringgold along East Chickamauga Creek and southwest of Ringgold along Little Chickamauga Creek. The relief is that of an undulating plain, broken more or less by shallow intermittent stream courses. The average slope of the surface is about 4 percent. The total extent of this soil is small. External drainage is good, but the silty clay subsoil retards the internal movement of water, and the slight depth to interstratified shale and sandstone limits the capacity for water absorption. This results in rather rapid run-off, which tends toward sheet erosion and gullying unless controlled.

About 80 percent of Apison very fine sandy loam, deep phase, is used for cultivated crops, 15 percent is in idle fields grown over with brush, 3 percent is in permanent pasture, and 2 percent supports a mixed growth of hardwood and pine. Of the cultivated land, 30 percent is in corn, 35 percent in cotton, 5 percent in truck crops, 5 percent in small grains, and 25 percent in hay. The fertilizer used for various crops, and recommendations for improvement are essentially like those described for Sequatchie fine sandy loam, except that all land with a slope of more than 5 percent needs either terracing or strip cropping, in order to prevent sheet erosion.

Sequatchie fine sandy loam.—The cultivated surface soil of Sequatchie fine sandy loam, to a depth of about 8 inches, is brown or grayish-brown mellow fine sandy loam or very fine sandy loam with some organic matter that is well incorporated with the mineral soil. Below this and continuing to a depth of about 15 inches is yellowish-brown fine sandy loam or very fine sandy loam. This layer rests on yellowish-brown friable firm loam, which, at a depth of about 18 inches, grades into yellowish-brown sandy clay loam. This, in turn, grades at a depth of about 25 inches into brownish-yellow sandy clay loam containing some ferruginous or manganese concretions. At a depth ranging from 39 to 48 inches the material is brownish-yellow heavy sandy loam. Field determinations show that both the surface soil and the subsoil are medium acid. In places, at a depth of about 40 inches, is a bed of mottled reddish-brown, brown, yellowish-brown, and gray brittle compact clay loam with much chert gravel. The stratified beds of gravel, sand, silt, and clay on which this soil occurs range in thickness from 2 to 20 feet and, in the eastern and central parts of the county, rest largely on interstratified beds of sandstone and shale and, in the western part, on beds of limestone.

Sequatchie fine sandy loam is well distributed over the county, in long narrow bodies on low terraces having an average slope toward the stream of about 2 percent. The soil materials have been washed from soils overlying sandstone and interstratified beds of either sandstone and shale or of limestone and shale.

The pervious character of the surface soil and subsoil assures excellent drainage and allows rapid absorption of rain water. The moisture-holding capacity is fair to good, depending largely on the amount of organic matter in the surface soil.

Probably 83 percent of this soil is cultivated, 8 percent is in idle fields, 8 percent in permanent pasture, and 1 percent in hardwood and pine forest. About 45 percent of the tilled land is used for cotton,

30 percent for corn, 5 percent for truck crops, 5 percent for small grains, and 15 percent for hay.

Because of its favorable texture, consistence, and relief, Sequatchie fine sandy loam is one of the most desirable soils of the county. Cotton yields an average of about three-fifths of a bale an acre, corn 17 bushels, hay four-fifths of a ton, and wheat 9 bushels. Land for cotton commonly receives an acre application of 150 to 200 pounds of 3-9-3, 4-10-4, or 4-12-4 commercial fertilizer.

The following rotation is recommended for building up and maintaining the productiveness of Sequatchie fine sandy loam: First year, cotton, with an application of 300 to 500 pounds of a 4-12-4 fertilizer at the time of planting, and later 100 pounds of nitrate of soda as a side dressing, when the squares first form. This should be followed in the fall with crimson clover, Austrian Winter peas, or hairy vetch, which should be plowed under in the spring as a green manure for corn. Second year, cornland should receive from 150 to 200 pounds of 3-9-3 fertilizer, or an equivalent quantity of higher analysis fertilizer, at the time of planting, and from 100 to 200 pounds of nitrate of soda when it reaches a height of 18 to 24 inches. The latter can be decreased and in some instances discontinued when the available nitrogen in the surface soil is sufficiently increased by the turning under of several crops of legumes. As stated previously, fertilizers of higher analysis, such as 5-10-5, generally are more economical to use than the older low-analysis fertilizer. Corn should be succeeded by winter grain and cowpeas. Erosion can be controlled by either terracing or strip cropping. A truck crop can be substituted in the rotation for cotton.

Much of Sequatchie fine sandy loam is so situated that spring waters, issuing from the lower valley slopes, could be used for irrigation. Where these waters come in contact with limestone or calcareous shale strata they carry a small quantity of lime, which would tend to neutralize the acid condition. This would make the land better suited for growing many legumes and thus more favorable for the accumulation of organic matter.

Waynesboro very fine sandy loam.—Under virgin conditions, the 4-inch surface layer of Waynesboro very fine sandy loam consists of grayish-brown to brownish-red mellow very fine sandy loam with some organic matter. It is underlain by light yellowish-gray very fine sandy loam carrying small rounded chert, argillite, and sandstone gravel. This layer is underlain, at a depth of about 15 inches, by grayish-yellow very fine sandy loam with reddish-yellow splotches, which grades at a depth ranging from 18 to 24 inches into yellowish-red heavy stiff very fine sandy clay with many small rounded pebbles. Below a depth of 40 inches the material is brittle friable clay or very fine sandy clay. The acidity of the surface soil is medium, and that of the subsoil and substratum is strongly acid. Scattered over the surface are small rounded pebbles of chert, argillite, and sandstone.

This soil is well distributed over the county in small areas. In places it is associated with Sequatchie fine sandy loam, but it occurs on terraces lying from 10 to 30 feet higher. The surface slope ranges from 3 to 15 percent and averages about 6 percent. Tilth conditions and the lay of the land are favorable. The porous character of the soil material provides good surface and internal drainage and rather rapid absorption of rain water. The moisture-retaining capacity is

about the average for the soils in the county. Moisture-absorbing and moisture-holding capacities could be much improved by plowing under legumes. The soil material has washed from slopes underlain by interstratified sandstone and shale, interstratified shale and limestone, beds of chert, and beds of limestone.

About 95 percent of this soil is cultivated, 2 percent is in idle fields, 2 percent is in permanent pasture, and 1 percent is covered with hardwood and pine. Percentages of land in various crops, treatment, and recommendations for improvement are much the same as for Sequatchie fine sandy loam, except that the higher average percentage of slope makes this land more susceptible to erosion and consequently somewhat less productive. For the control of erosion, it is suggested that a combination of terracing and strip cropping be used. The yields on Waynesboro very fine sandy loam are approximately the same as those obtained on Sequatchie fine sandy loam under similar fertilization and management.

Cumberland very fine sandy loam.—Cumberland very fine sandy loam is like Waynesboro very fine sandy loam in its occurrence on high terraces along streams, in being well distributed throughout the county, in its surface soil and subsoil reactions, its relief, external and internal drainage, moisture-absorbing and moisture-holding capacities, and erodibility. The surface soil is brown or reddish-brown very fine sandy loam, which grades, at a depth of about 8 inches, into red friable firm clay with some small rounded pieces of chert, sandstone, and argillite gravel. This material continues downward to a depth of 48 or more inches. When moderately moist, the clay breaks under slight pressure into irregular lumps about the size of a pea. This structure gives the soil material a perviousness, which favors the circulation of air and water as well as the penetration of roots.

Included with this soil in mapping are about 80 acres of Dewey very fine sandy loam, occurring 1 mile southwest of Ringgold. Here, the surface soil, to a depth of 6 inches, is gray very fine sandy loam. This rests on reddish-yellow silty clay loam, which, at a depth of about 10 inches, is underlain by red friable firm clay with some chert fragments. In the eastern half of the county, small patches of Abernathy silt loam, totaling about 90 acres, have been included.

Cumberland very fine sandy loam is an inextensive soil. Probably 95 percent of the land is cultivated. The crops grown, agricultural practices, and suggestions for improvement of Sequatchie fine sandy loam apply also to this soil. The yields are slightly higher than those obtained on Waynesboro very fine sandy loam.

Allen very fine sandy loam.—The main developments of Allen very fine sandy loam are on colluvial and alluvial fans extending from the west base of White Oak Mountain and Taylor Ridge. Clay, silt, fine sand, gravel, cobbles, and subangular rocks rolled down from the mountains or were brought down by torrential streams from lands overlying interstratified sandstone and shale.

The surface soil of Allen very fine sandy loam, in cultivated fields, consists of brown mellow very fine sandy loam with some organic matter. The upper part of the subsoil is light reddish-yellow or brownish-yellow very fine sandy loam. Below a depth of 18 inches is reddish-yellow or light reddish-brown friable clay, which, when moderately moist, breaks to buckshot-sized lumps under gentle pressure. This condition favors the penetration of roots and the

internal circulation of water and air. Below a depth of 24 to 30 inches the material consists of reddish-brown very fine sandy clay with roughly stratified layers of gravel and sand, and this rests, at a depth of about 48 inches, on interstratified sandstone and shale. Cobbles and boulders are scattered over the surface and are embedded in the soil material to a depth of 2 feet or more.

The total area of Allen very fine sandy loam is not large. The average surface slope is approximately 5 percent. External and internal drainage are good. Rain water is quickly absorbed and fairly well retained. Because of the torrential currents that flow out over these lands, erosion is a serious problem in many places. Thus, a combination of terracing and strip cropping is essential in many places for the control of erosion.

About 80 percent of this land is cultivated, 5 percent is idle, 5 percent is in permanent pasture, and 10 percent is in hardwood and pine. About 20 percent of the cultivated land is used for corn, 50 percent for cotton, 20 percent for hay, 5 percent for truck crops, and 5 percent for small grains. Methods of fertilization, treatment, and recommendations for improvement are practically the same as those described for Sequatchie fine sandy loam, but yields, owing to eroded spots in the fields and a somewhat lower content of available plant nutrients, are somewhat lower.

Wolftever silt loam.—In cultivated fields the 6-inch surface soil of Wolftever silt loam is light grayish-brown friable silt loam or very fine sandy loam with many ferruginous or manganese concretions, of about buckshot size, scattered over the surface. Beneath this is brownish-yellow silty clay which, at a depth of about 15 inches, grades into brownish-yellow silty clay mottled with grayish yellow. At a depth of 19 to 23 inches this material grades into mottled gray, yellow, and brown very heavy compact tight silty clay. At a depth ranging from 28 to 40 inches is gray heavy silty clay, with yellow and brown mottlings, and this material rests at a depth of about 50 inches, on limestone interstratified with thin beds of calcareous shale.

On the low terraces along West Chickamauga Creek and its tributaries southwest of Lake Winnepesaukah are brown or grayish-brown mellow surface soils and yellowish-red tight tough subsoils.

Wolftever silt loam occurs on terraces and colluvial flats along West Chickamauga, Peavine, and Spring Creeks and their tributaries and along Little Chickamauga Creek. The average surface slope is about 3 percent. Surface drainage is fair, but the heavy subsoil retards the downward movement of ground water, so that rain water drains off the surface rather quickly, causing more or less sheet erosion and some gullying.

About 75 percent of this land is cultivated, 10 percent is idle, 10 percent is in permanent pasture, and 5 percent is in hardwood and pine. Relative proportions of lands devoted to particular crops, fertilizers used, and recommendations offered for Colbert silt loam are applicable to Wolftever silt loam.

Pope silt loam.—Pope silt loam has a grayish-brown or yellowish-brown friable mellow slightly acid to medium acid silt loam surface soil, which ranges in thickness from 10 to 20 inches. It is well supplied with organic matter. Below this is grayish-yellow or brownish-yellow friable silt loam, which continues to a depth of 5 feet or more. The soil mass contains considerable very fine sand and fine sand

throughout, and in many places the texture is loam, very fine sandy loam, or fine sandy loam. Pope silt loam is the well-drained soil occurring in the first bottoms along all the principal streams of the county and more or less along their tributaries. The alluvium is mixed with colluvial materials, and especially is this true where narrow bottoms, ranging from 50 to 200 feet in width, are flanked by steep slopes, which have been seriously eroded. The surface is almost level, but there is a gentle slope (2 percent or less) toward the stream. The soil material represents an accumulation of wash from lands underlain by interstratified sandstone and shale and interstratified shale and limestone.

About 95 percent of this land is cultivated, and the rest is in pasture. Of the cultivated land 90 percent is used for corn, 3 percent for cotton, 3 percent for truck, and 4 percent for hay. Ordinarily no commercial fertilizer is used. Corn yields average about 30 bushels an acre, cotton three-fifths of a bale, and hay 1¼ tons. Because of its high content of organic matter and plant nutrients, good tilth, good drainage, and favorable consistence throughout, Pope silt loam is particularly suited to the production of corn and hay. Recommendations offered for the improvement of Philo silt loam apply as well to this soil.

Pope fine sandy loam.—Pope fine sandy loam is developed in the flood plains of streams in all parts of the county, but most extensively along East Chickamauga, West Chickamauga, and Little Chickamauga Creeks. The surface is almost level, the slope being less than 2½ percent. Drainage is good, owing to a decided porosity throughout.

In cultivated fields the 12-inch surface soil is grayish-brown slightly acid fine sandy loam containing a small amount of organic matter, which is well incorporated with the finer textured mineral soil. Below this and continuing to a depth of 40 inches, the subsoil is light grayish-brown fine sandy loam, with a reaction ranging from medium to very acid.

Included with this soil in mapping are about 60 acres of Pope loamy fine sand, which occurs northwest of Graysville. This differs from the typical soil in having a loamy fine sand texture throughout.

All the soil is cultivated except perhaps 5 percent of it that is close to streams and subject to frequent inundation. Most of such areas provide pasturage but are covered with a scattered growth of sycamore, alder, red maple, willow, oak, elm, walnut, common locust or black locust, tuliptree, and pine. This land is devoted to the same crops as is Pope silt loam, but yields are a little lower because of less organic matter and available plant nutrients.

Incorporation of organic matter in the surface soil is particularly needed. This would increase the moisture-absorbing and moisture-retaining capacities, provide better tilth, supply nitrogen, and, on decomposing, liberate plant nutrients.

Roane silt loam.—The soil materials comprising Roane silt loam have been washed from lands of Clarksville cherty silt loam, Fullerton silt loam, and their phases. This is a lighter colored and less productive soil than Pope silt loam.

The 8-inch surface soil of Roane silt loam is light grayish-brown friable silt loam containing a small amount of organic matter. Underlying this is light brownish-gray silt loam containing considerable

very fine sand and a few small chert fragments. Below a depth of 15 inches is light brownish-gray or grayish-yellow cherty silt loam, which rests, at a depth ranging from 24 to 36 inches, on a compact angular chert and silty clay hardpan that is light gray with some brown mottles.

Included with Roane silt loam, as mapped, are many small areas along intermittent streams of Peavine and Boynton Ridges and other ridges in the northeastern part of the county, where chert fragments are so numerous on the surface and throughout the surface soil and subsoil that the land cannot be cultivated.

Roane silt loam occurs in the flood plains of streams in almost all parts of the county, although it is most extensive on Peavine Ridge. The surface slope does not exceed 2.5 percent. The soil material, for the most part, has been washed from areas of Clarksville and Fullerton soils. Surface drainage is good, but internal drainage is impeded by the hardpan layer. Owing to its perviousness, this soil quickly absorbs rain water. Its moisture-holding capacity is only fair.

About 80 percent of the land is cultivated, 5 percent is idle, and 15 percent is in thinly wooded pasture. Of the tilled land, 60 percent is devoted to corn, 25 percent to hay, 10 percent to cotton, and 5 percent to small grains. Owing to its better water-holding capacity, better supply of organic matter, and larger supply of available plant nutrients, yields of corn and hay are higher than on the Clarksville and Fullerton soils.

Philo silt loam.—Like Pope silt loam, this soil occurs on flood plains along streams. The two soils have about the same relief and similar sources for their parent materials. Drainage, however, is not so well established in the Philo soil as in the Pope soil, and in wet years corn suffers from an excess of moisture.

In cultivated fields the surface soil to a depth of 10 inches is grayish-brown mellow silt loam containing some organic matter. This is underlain by grayish-yellow or light grayish-brown friable silt loam, which is faintly mottled with gray and brown below a depth ranging from 15 to 20 inches. The mottlings become more prominent and numerous with increasing depth. Field tests reveal a slightly acid surface soil, except in the southeastern and east-central parts of the county, where the soil material came from strongly acid shale. Here, the reaction is medium to strongly acid and the content of organic matter and plant nutrients is lower. These conditions are reflected in smaller yields per acre.

Philo silt loam is the most extensive soil of the flood plains and of the group of Second-class soils. It occurs in all parts of the county, but the largest areas border East and West Chickamauga Creeks. Surface drainage is good in normal years, but internal drainage is only fair.

Probably 80 percent of this land is cultivated, and most of the rest is in permanent pasture or wild hay.

For the improvement of this soil an acre application of 300 pounds of 16-percent superphosphate and 1 ton of limestone should be made, and a rotation consisting of corn interplanted with cowpeas, succeeded with 2 years of grass, including white clover, timothy or herd's-grass, Dallis grass, alsike clover, and lespedeza, should be practiced. After the soil is limed, white clover can be added.

THIRD-CLASS SOILS

Third-class soils have negative qualities that make them less desirable for crop production than those of the Second class, but they are better adapted to crops than to pasture. For instance, Clarksville cherty silt loam has a steeper slope and is more eroded, Apison very fine sandy loam and Waynesboro very fine sandy loam, eroded phase, are much more seriously eroded, Colbert silt loam and its slope phase have a more impervious subsoil, and Jefferson fine sandy loam is more stony than any member of the Second class. The Clarksville, Apison, and Colbert soils occur on the uplands, the Waynesboro soil on stream terraces, and the Jefferson soil on alluvial fans, colluvial deposits, or terraces.

Clarksville cherty silt loam.—Clarksville cherty silt loam differs from its smooth phase in having a steeper slope, ranging from 7.5 to 15 percent. This condition has allowed more erosion, which has resulted in a thinner surface soil, loss of available plant nutrients, less organic matter, and lower moisture-absorbing and moisture-conserving capacities. Consequently, crop yields are somewhat lower than those obtained on Clarksville cherty silt loam, smooth phase.

This soil occurs principally on slopes of ridges in close association with Clarksville cherty silt loam, smooth phase. Drainage ranges from good to excessive.

About 75 percent of the land is cultivated. Relative acreages for different crops, fertilization, and recommendations for improvement are essentially the same as for Clarksville cherty silt loam, smooth phase, except that terracing in conjunction with strip cropping, in order to control erosion, should be practiced in addition. The strip crops can enter the rotation and may consist of lespedeza or cowpeas. Where the fertility is very low, sorghum, as a green-manure crop, will prove beneficial.

Apison very fine sandy loam.—Apison very fine sandy loam occurs in comparatively large valley areas in the eastern part of the county, between ridges covered with Clarksville and Fullerton soils or Muskingum soils. The relief is characterized by low gently sloping ridges, which are much dissected by small intermittent drainageways, and the steeper slopes are cut by small gullies. The average slope is about 5 percent.

In cultivated fields Apison very fine sandy loam has a 4-inch surface layer of brownish-gray very fine sandy loam containing a small quantity of organic matter. Under this is a yellowish-brown very fine sandy loam, which grades, at a depth of about 10 inches, into brownish-yellow brittle friable slightly compact silty clay loam. Under average moisture conditions and under moderate pressure, this material breaks to irregular-shaped lumps averaging about the size of a navy bean. At a depth ranging from 14 to 20 inches this layer rests on beds of interstratified shale and sandstone, the former comprising 80 percent of the formation.

Combined with Apison very fine sandy loam on the soil map is a total of about 1 square mile of Apison fine sandy loam. This inclusion differs from the typical soil in having a deeper surface soil, which is somewhat better supplied with organic matter and plant nutrients, and a more friable and pervious subsoil. It is developed from an interstratified sandstone and shale formation in which the

beds are about 75 percent sandstone and 25 percent shale. This variation extends from the typical areas of Apison very fine sandy loam westward, occurring on the lower slopes of White Oak Mountain and Taylor, Dick, Cherokee, and other sandstone ridges, also on the valley floors of Little Chickamauga, East Chickamauga, Dry, Daniel, and Tiger Creeks and Cherokee Branch. Closely associated with this variation are soil materials that have been washed down from the ridges and deposited as alluvial fans in the valleys. From these materials Apison very fine sandy loam, deep phase, was developed, but subsequently, through neglect in controlling erosion, 75 percent or more of the surface soil was washed away. This eroded land, covering an area of about 100 acres, is included with Apison very fine sandy loam in mapping. A third inclusion, which has an aggregate area of about 60 acres and occurs in the vicinities of Catoosa Springs and Copeland, is underlain by purple shale with thin layers of sandstone. The surface soil and most of the subsoil have eroded.

Three miles east of Ringgold and immediately north of the junction of Tiger Creek and Catoosa Spring Branch on the Military Reservation are 40 acres of Apison fine sandy loam that has been decidedly modified by grading and excavating in preparation for a target range.

Surface drainage of Apison very fine sandy loam is good, but internal drainage is somewhat impeded because of the slightly compact subsoil and the nearness to the surface of the bedrock, but it is favored by a pronounced tilting of the underlying strata, so that percolating waters can enter readily between the sandstone layers. Because of the low content of organic matter and the thin surface layer, both moisture-absorbing and moisture-holding capacities are low. Owing to slow absorption, water flows rapidly over the surface, after heavy rains, washing away the surface soil and cutting shallow gullies.

Perhaps 90 percent of this land has been cultivated at some time; but, because of a failure to terrace, plant strip crops, and maintain winter cover crops, only about 10 percent is now tilled; 60 percent is idle, 20 percent is abandoned, and 10 percent is covered with hardwood and some pine. About 20 percent of the cultivated land is devoted to corn, 40 percent to cotton, 10 percent to truck crops, 10 percent to small grains, and 20 percent to hay. Cotton yields about one-third bale to the acre, corn 10 bushels, hay one-half ton, and wheat 7 bushels.

A common practice is to make an acreage application of 150 pounds of a 3-9-3 fertilizer for cotton, 100 pounds of 16-percent acid phosphate for corn, and 100 pounds of 16-percent acid phosphate for wheat. Where corn succeeds cotton, the land receives no fertilizer.

This soil is best suited to cotton, sweetpotatoes, and general truck crops, provided a large quantity of commercial fertilizer is used. Cotton, sweetpotatoes, or truck crops should be followed by Austrian Winter peas, these by corn intertilled with cowpeas, and these, in turn, by lespedeza and grain for 3 years. The county agent is actively making these recommendations. To control erosion, all slopes should be terraced and the steeper ones should be strip cropped. Before an attempt to establish a permanent pasture, land for lespedeza and small grains should, during a period of 2 years, receive from 200 to 300 pounds to the acre of 16-percent superphosphate and 2 tons of ground

limestone. The pasture grasses suggested for Colbert silty clay loam are adapted to this land.

Colbert silt loam.—Colbert silt loam is one of the more extensive agricultural soils. The larger bodies are in the western part of the county and in the valley immediately west of White Oak Mountain and Taylor Ridge. The surface features are characterized by smooth undulations and long gentle slopes on low ridges, with the slope averaging about 4 percent.

In cultivated fields the surface soil to a depth of 6 or 7 inches consists of brownish-gray or yellowish-gray silt loam containing some organic matter. Underlying this is light grayish-yellow heavy silt loam, which, at a depth of about 14 inches, grades into yellow or brownish-yellow silty clay containing some manganese or ferruginous concretions. With increasing depth these concretions become more numerous, and below a depth of 18 inches the material is brownish-yellow heavy plastic impervious silty clay. This rests on a limestone formation interbedded with thin layers of calcareous shale.

In the valley of Peavine Creek there are included in mapping areas totaling about 1.8 square miles that differ from Colbert silt loam principally in that they are underlain by shale interbedded with thin layers of limestone. Colbert silt loam along West Chickamauga and Peavine Creeks includes some flat to undulating areas, where the surface is covered with buckshot-sized concretions of iron oxide or manganese oxide, and in places the subsoil shows some evidence of water assortment.

Because of the impervious subsoil layers, the movement of ground water is greatly impeded. The soil in old cultivated fields warms slowly in the spring and remains waterlogged for a long time after heavy rains. In the woods or newly cleared fields, where tree roots are in all stages of decomposition, internal drainage, although poor, is decidedly better than in old cultivated fields, as the soil material runs together under cultivation and closes old root courses. Except where there are thick organic layers, the moisture-absorbing capacity is low, as rain water cannot percolate into the heavy subsoil quickly, and is compelled to a high degree to flow over the surface and thereby greatly damage unprotected land by sheet erosion and gullying.

Probably 60 percent of this soil is cultivated, 10 percent is idle, 15 percent is in permanent pasture, and 15 percent supports a growth of hardwood and some pine. About 35 percent of the cultivated land is used for corn, 20 percent for cotton, 5 percent for truck, 10 percent for grain, and 30 percent for hay. Corn yields about 16 bushels an acre, wheat 10 bushels, cotton one-half bale, and hay three-fourths ton.

Where this soil is used for cultivated crops, it is much in need of (1) a system of farming wherein the organic matter will be increased and maintained, (2) a deep-rooted crop that will penetrate the heavy subsoil, (3) an application of ground limestone to neutralize the acidity and flocculate the finer particles in the surface soil, and (4) terracing combined with strip cropping to prevent erosion. It is recommended that Colbert silt loam be used for hay and pasture in conjunction with the raising of beef cattle. For hay, lespedeza, cowpeas, sorghum, and soybeans should be used, and for pasture, lespedeza, timothy or herd's-grass, Dallis grass, hop clover, white clover, and alsike clover. An acre application of 300 pounds of 16-

percent superphosphate, or its equivalent, and 2 tons of ground limestone should be used for pastures. If ground limestone is applied before the grass seed is sown it should be drilled in, but if applied after the pasture is established it can be broadcast on the grass. All slopes of more than 2 percent should be terraced for the prevention of erosion and the conservation of moisture.

Waynesboro very fine sandy loam, eroded phase.—Waynesboro very fine sandy loam, eroded phase, is similar to Waynesboro very fine sandy loam and Cumberland very fine sandy loam except that most of the original surface soil has been eroded, the subsoil is exposed in many places, and gullies are common. Included with this soil on the map is a total of one-third of a square mile, occurring in small areas, of the eroded phase of Sequatchie fine sandy loam. Also included in mapping is a very small area of Dewey silty clay loam south of Wood Station near Bethel Church. This soil is the equivalent of Dewey silt loam, with the surface soil largely gone. Its surface soil is gray friable silt loam, underlain, at a depth of about 3 inches, by reddish-yellow silty clay loam, which, at a depth of about 9 inches, grades into red friable firm clay containing some chert fragments.

Waynesboro very fine sandy loam, eroded phase, is closely associated with Waynesboro very fine sandy loam in all parts of the county. Drainage is good, and the slopes range from 5 to 15 percent.

Practically all of this land was under cultivation, but owing to the neglect of farmers to protect it from erosion, it is now used, for the most part, for pasture, and some is idle. Possibly 20 percent is cultivated, but average yields are 25 percent less than on Waynesboro very fine sandy loam.

To increase and maintain the productiveness of this land, the requirements in rotation, terracing, and strip cropping are decidedly more exacting than for Waynesboro very fine sandy loam. A use of this land recommended by the county agent is for it to be devoted to pastures of Bermuda grass, lespedeza, alsike clover, and Dallis grass for summer, and ryegrass for winter. For this purpose terracing, liming, and applying phosphate are essential for success.

Jefferson fine sandy loam.—Jefferson fine sandy loam differs from Allen very fine sandy loam in its yellow or brownish-yellow subsoil, in the greater quantity of boulders and cobbles scattered over the surface and embedded in the soil, so as to interfere materially with cultivation, in its somewhat lower contents of organic matter and available plant nutrients, and in having an average slope of about 6 percent.

The cultivated 8-inch surface soil of Jefferson fine sandy loam is grayish-brown fine sandy loam or very fine sandy loam with a little organic matter well combined with the mineral soil. The upper part of the subsoil is yellow or brownish-yellow fine sandy loam, which grades, at a depth of about 19 inches, into brownish-yellow silty clay loam that readily breaks into lumps about the size of a pea. Below a depth ranging from 30 to 40 inches is roughly interstratified friable reddish-brown clay loam or brown gravelly loam.

Jefferson fine sandy loam occurs in small areas along the bases of White Oak and Sand Mountains and Taylor and Cherokee Ridges. The soil materials have rolled down or washed down from soils underlain by sandstone and shale of the mountain and ridge slopes

onto almost level, undulating, and sloping valley floors. External and internal drainage are good. Absorption of rain water is favored by the pervious character of the surface soil and subsoil, but, because of its low content of organic matter, this soil has low moisture-holding capacity.

About 60 percent of the land is cultivated, 20 percent is idle, 10 percent is used for permanent pasture, and 10 percent is woodland. Recommendations for fertilization and rotations are comparable to those made for Sequatchie fine sandy loam, but the stoniness, lower contents of organic matter and plant nutrients, and the eroded condition of this soil reduce yields considerably below those obtained on the Sequatchie soil. All fields should be terraced to prevent erosion, and the steeper slopes should also be strip cropped.

FOURTH-CLASS SOILS

Fourth-class soils, because of deteriorative or inherently undesirable conditions, are unsuitable for cultivated crops; but such land, because of a fair degree of fertility and a moderate to good moisture-holding capacity, produces or can be made to produce profitable pasture. For example, Atkins silt loam and Melvin silty clay loam are too poorly drained, and Fullerton cherty silt loam, eroded phase; Apison very fine sandy loam, eroded slope phase; Dandridge silt loam; Colbert silt loam, slope phase; Colbert silty clay loam; Colbert silty clay loam, slope phase; and rolling stony land (Colbert soil material) are too seriously eroded or too shallow to bedrock for successful cultivation of crops. In most places tillage would be difficult.

Fullerton cherty silt loam, eroded phase.—Fullerton cherty silt loam, eroded phase, differs from Fullerton silt loam in having lost two-thirds or more of its original surface soil by sheet erosion. In many places the reddish-yellow friable silty clay subsoil is exposed on the surface.

The larger bodies of this soil are on ridge slopes southwest of Wood Station and south of Keith, but the total area is not large. Its slopes range from 2.5 to 15 percent and average about 8 percent. The friable surface soil and subsoil provide good surface and internal drainage and fair moisture-absorbing and moisture-holding capacities. These latter features, as well as tilth, could be much improved by growing and plowing under soil-improvement crops.

Practically all of this land has been cultivated at one time, but at present perhaps 25 percent of it is tilled, 50 percent is in idle fields where sheet erosion has made cropping unprofitable, 10 percent is in pasture, and 15 percent is covered with a comparatively young growth of hardwood and pine.

The crops grown and the fertilization used for the cultivated land are about the same as for Clarksville cherty silt loam, smooth phase, but crop yields are 15 percent or more lower.

The best use of this land is for pasture; and an application of lime and phosphorus, terracing for the control of run-off, conservation of moisture, and thinning out of brush and trees where needed to admit sunlight, are recommended. For summer pasture, lespedeza, Bermuda grass, alsike clover, and Dallis grass are recommended, and for winter pasture, ryegrass.

Apison very fine sandy loam, eroded slope phase.—Apison very fine sandy loam, eroded slope phase, extends over an aggregate area of 6.7 square miles. It is intermixed with areas of typical Apison very fine sandy loam, but it differs from that soil in that it occupies slopes with an average gradient of about 10 percent, in that it is more stony, and in having more rock outcrops and a lower content of available plant nutrients. It also is more severely eroded than the typical soil and consequently has a thinner surface soil. Both the subsoil and the substratum are almost identical with corresponding layers of Apison very fine sandy loam.

Many small included areas on forested ridges are not eroded. The variations of this soil are intricately associated with similar variations in the typical soil, from which they differ in steeper slopes, more severely eroded conditions, more stoniness, and smaller supply of plant nutrients. The included soil that is derived from 75 percent sandstone and 25 percent shale materials and has a deeper, more fertile surface soil and more open subsoil covers a total area of about 2¼ square miles, whereas the inclusion that occurs on alluvial fans in the valleys extends over a total area of about one-twelfth of a square mile. A third variation, aggregating about 130 acres in extent, occurring 3 miles southeast of Ringgold, has little or no surface soil or subsoil overlying the soft purple shale. A very small area of rough gullied land also is included with this soil in mapping.

About 85 percent of this land was cultivated at one time, but, owing to erosion, 80 percent of the once-cultivated area is now idle or abandoned. The crops grown and the fertilization are about the same as those described for Apison very fine sandy loam, but yields are 20 percent or more less than on that soil.

This land is considered to be best suited for pasture, and the same grasses are recommended as for Colbert silty clay loam and Apison very fine sandy loam.

Dandridge silt loam.—Dandridge silt loam occurs principally in Houston Valley. Its total area is very small. The relief ranges from gently sloping to rolling or hilly, and the average gradient is about 10 percent.

In the virgin condition, the 2-inch surface layer of Dandridge silt loam is pale yellowish-gray silt loam. It is underlain by pale grayish-yellow silt loam, which below a depth of 5 inches is yellow friable silt loam. At a depth of about 10 to 12 inches this material grades into mottled gray, yellow, and brown heavy silty clay, which is only a few inches thick and grades into brown shale. At a depth of about 25 inches, this, in turn, rests on gray calcareous shale. Scattered over the surface and more or less embedded throughout the soil are small flat fragments of shale. More or less interspersed with areas of Dandridge silt loam are small areas of a soil underlain by reddish-purple calcareous shale.

Surface drainage is good, but the heavy silty clay subsoil and the low dip of much of the strata retard the circulation of ground water, interfere with the absorption and retention of moisture, and after heavy rains cause rapid run-off, which induces serious erosion.

About 10 percent of this soil is cultivated. About 80 percent of the land has been tilled, however, and is now either idle or abandoned because of sheet erosion and gullying. Fertilization, crops produced, yields, and recommendations for improvement are very much the

same as those given for Apison very fine sandy loam, eroded slope phase.

Colbert silty clay loam.—Colbert silty clay loam is the equivalent of Colbert silt loam with an average of less than two-thirds of the surface soil, leaving the texture a silty clay loam. In places the yellow heavy plastic silty clay subsoil is on the surface or is beneath a thin layer of light brownish-gray silt loam. Outcrops of limestone are common.

This soil has the same distribution as, and is intimately associated with, Colbert silt loam and rolling stony land (Colbert soil material). Inclusions of these lands are made in practically all mapped areas because they could not be shown separately on a small-scale map. One mile south of Ringgold are about 60 acres of Colbert silty clay loam, where the impervious silty clay subsoil is light reddish yellow or light yellowish red.

This soil is developed on slopes with gradients ranging from very slight to 8 percent. Surface drainage is good, but internal drainage is especially poor, owing to the heavy impervious subsoil. In average years enough moisture is absorbed and retained for the growth of fair to good pasturage.

Most of the soil was once cultivated, but uncontrolled erosion has limited its profitable use to pasture. Perhaps 10 percent is still cultivated, 30 percent is in permanent pasture, 10 percent is idle, and 50 percent supports a comparatively young growth of hardwood and pine. Some corn, cotton, and grain are grown. Crops, fertilization, and general methods of treatment are essentially like those described for Colbert silt loam, but yields are much lower. The thin surface soil, low content of organic matter, nearness of the limestone to the surface, and heavy impervious subsoil are characteristics that cause Colbert silty clay loam to be droughty and comparatively unproductive.

The same practices for the improvement of Colbert silty clay loam hold for Colbert silt loam, except that, if possible, the silty clay loam should be devoted entirely to pasture. White and alsike clover may be left out of the grass mixture advantageously. Kudzu is an excellent crop for reclaiming gullied and severely eroded land. Its heavy rooting system tends to hold the soil in place, enables gullies to fill with wash, opens up the tight subsoil for better drainage and aeration, supplies a much-needed organic matter, and provides excellent pasture. A volunteer growth of honeysuckle vines on these eroded slopes is a conspicuous part of nature's method of reclamation. With planting and care this plant would be more effective in retarding erosion.

Colbert silty clay loam, slope phase.—More or less distributed within areas of Colbert silty clay loam are small areas of its slope phase. This soil differs from the typical soil in having slopes ranging from 7.5 to 15 percent, a thinner organic layer, and more limestone fragments scattered over the surface and embedded in the soil. In most places where the land has been cultivated, gullies and outcrops of limestone are numerous.

Colbert silt loam, slope phase.—Colbert silt loam, slope phase, is very inextensive. It occurs on 7.5 to 15 percent slopes within areas of Colbert silt loam. It differs from the typical soil in its thinner organic layer, in having more outcrops of limestone, and in its susceptibility to erosion when cultivated.

Rolling stony land (Colbert soil material).—Rolling stony land (Colbert soil material), locally known as glades, represents a condition in which limestone outcrops so completely cover the surface that it is not possible to plow or cultivate the land. In some places, between outcrops, the soil material ranges from a few inches to several feet in thickness.

This soil condition is closely associated with Colbert silty clay loam and Colbert silt loam and has essentially the same general distribution. The total area is not large. The land includes low smooth ridges with long gentle slopes. The average slope is about 6 percent. Between outcrops the drainage tends toward excessiveness. Bluegrass, alfalfa, sweetclover, and white clover make rapid growth on the neutral soil materials in the early spring when moisture is adequate, but later they dry up.

Although none of this land is now used for cultivated crops, a few decades ago about 25 percent of it was tilled. Farmers failed to grow cover crops and protect the soil, and serious erosion soon denuded the land of the surface soil and, in places, the subsoil. The tree growth consists largely of black locust and red cedar.

Better pasture could be obtained if the brush were cut and the trees thinned, in order to admit more sunshine. In places perennial springs could be utilized for irrigation with little expense except labor during slack seasons. This would assure pasture for the entire year. A very small area of rough gullied land is included with this soil in mapping.

Melvin silty clay loam.—Melvin silty clay loam occurs on the stream flood plains in the same general sections as the Colbert soils. Its 6-inch surface soil under normal moisture conditions is gray heavy silt loam in which considerable organic matter is well incorporated. Underlying this is olive-gray silty clay loam, which, at a depth of about 10 inches, grades into heavy silty clay with mottlings of gray. The soil material of Melvin silty clay loam has been washed from the Colbert soils and is slightly acid.

The total area of this land is about 4½ square miles. Its surface is almost level, sloping gently toward the stream and in no place exceeding a gradient of 2.5 percent. Because of its heavy texture and impervious subsoil, only about 10 percent of the land is cultivated; about 10 percent is in woodland, and the rest is in pasture. Of the cultivated land, about 20 percent is used for corn and 80 percent for hay.

With present drainage conditions pasture is the best use for this land, and the same grasses are used and the same practices apply as for Philo silt loam, except that, owing to the lower degree of acidity, less ground limestone is needed per acre.

Atkins silt loam.—Atkins silt loam occupies the more poorly drained situations on the flood plains in all parts of the county. It is suitable only for pasture, except where underdrained. The surface soil consists of gray silt loam to a depth of about 10 inches. This material grades into a gray heavy silt loam subsoil containing mottlings of light gray and yellow to a depth of 40 or more inches.

There are low, poorly drained terraces along Spring and West Chickamauga Creeks where the soil profiles are comparable to those of Atkins silt loam, but the land is not subject to stream overflow. In mapping, these areas, which comprise an aggregate of one-third

of a square mile, are combined with Atkins silt loam. Along Little Chickamauga Creek and its main tributaries are low, very poorly drained areas of pasture lands that differ from Atkins silt loam in having a chert hardpan layer at a depth ranging from 20 to 36 inches. Their total area is about 100 acres. These also are included with Atkins silt loam on the soil map.

The soil material of Atkins silt loam has been washed principally from slopes covered with Apison, Fullerton, Clarksville, and Waynesboro soils, and to less degree from those occupied by Colbert, Dandridge, Muskingum, Hanceville, Sequatchie, Allen, and Jefferson soils. Natural surface run-off is very slow, and in depressions water remains until evaporated. Owing to a high water table, both external and internal drainage are very poor.

Generally, this soil is not cultivated but is used for pasture and forest. Its fair supply of organic matter and good supply of moisture favor permanent pasture. By thinning the growth of trees and removing the underbrush, so that the sunshine can reach the ground, much better pasture can be developed. Where tilled, Atkins silt loam has proved to be one of the best soils for corn in the county. The areas are small, very scattered, and inaccessible, however, and have poor drainage outlets. It is questionable whether, on many farms, reclamation would be profitable. It is apparent also that Atkins silt loam associated with Apison very fine sandy loam and its eroded slope phase is more acid and affords less pasture than elsewhere in the county.

The same treatment and pasture grasses apply for Atkins silt loam as for Philo silt loam.

FIFTH-CLASS SOILS

To the Fifth-class soils suitable only for forest land belong Clarksville cherty silt loam, hill phase; Clarksville cherty silt loam, steep phase; Muskingum stony fine sandy loam; rough stony land (Muskingum soil material); and Hanceville stony fine sandy loam. The first and second have gray surface soils and are developed mainly from chert beds with thin seams of clay; the third and fourth have brownish-gray surface soils and are developed from the weathered interstratified beds of sandstone and shale; and the fifth has a brownish-gray or reddish-brown surface soil and has developed from the disintegration of interstratified ferruginous sandstone and shale. All these soils and soil materials have water-holding capacities too low for satisfactory pasture, and slopes too steep and stony for cultivation.

Clarksville cherty silt loam, hill phase.—Clarksville cherty silt loam, hill phase, differs from the typical soil mainly in having slopes ranging from 15 to 30 percent, a thinner surface soil and subsoil, more chert fragments on the surface and throughout the profile, and underlying beds of chert nearer the surface and outcropping in many places.

Closely intermixed and included in mapping with this soil are areas of Fullerton cherty silt loam, hill phase, having a total extent of about 2½ square miles. These differ from typical Fullerton cherty silt loam mapped in Hamilton County, Tenn., as Clarksville cherty silt loam, hill phase, differs from Clarksville cherty silt loam.

Clarksville cherty silt loam, hill phase, is extensive, covering a total area of 18.7 square miles. It has essentially the same general distribution as Clarksville cherty silt loam. Its openness allows rapid percolation of rain water, but this feature, together with its low content of organic matter, gives it a very low water-holding capacity.

About 3 percent of this land is cultivated in conjunction with Clarksville cherty silt loam, but yields are 30 percent lower than on that soil. The rest is in forest. Recommendations as to its use are given in the section on forest under Land Uses and Soil Management.

Clarksville cherty silt loam, steep phase.—The steep phase of Clarksville cherty silt loam differs from the hill phase primarily in that it occupies steeper slopes that range from 30 to more than 60 percent. It also includes more chert outcrops. It commonly occurs on the upper slopes of steep narrow chert ridges and is closely associated with typical Clarksville cherty silt loam and its hill phase.

Interspersed throughout areas of this soil and combined with it in mapping are about 2 square miles of Fullerton cherty silt loam, steep phase. This included soil has about the same steep slope as Clarksville cherty silt loam, steep phase, but differs in having a light-red subsoil.

All this land is in forest consisting largely of post, blackjack, and southern red oak. Owing to its steep slope, droughtiness, and low content of organic matter and available plant nutrients, it would seem advisable that it remain as it is. Recommendations for forest are given in the section on Land Uses and Soil Management.

Muskingum stony fine sandy loam.—Muskingum stony fine sandy loam, an extensive soil, occupies rough steep slopes and stony lands, mainly on White Oak and Sand Mountains and Taylor, Cherokee, and Dick Ridges, as well as some higher ridges in the eastern part of the county. Slopes range from 30 to 60 percent.

In the virgin condition a ½-inch layer of gray loose mineral material containing considerable incoherent organic matter that is not an integral part of the mineral constituents covers the surface of Muskingum stony fine sandy loam. Below this and continuing to a depth of 8 inches is pale yellowish-gray porous fine sandy loam or very fine sandy loam, which rests on yellowish-brown loam. Many small pieces of sandstone and shale are present in this material. At a depth of about 10 to 12 inches the underlying sandstone, interstratified with a smaller amount of shale, is reached. As mapped, Muskingum stony fine sandy loam includes many small areas of Hanceville stony fine sandy loam. Such areas have a red fine sandy clay subsoil.

Steepness of slope, stoniness, and droughty condition restrict the use of this land to forest products. Recommendations for handling forest lands are given in the section on Land Uses and Soil Management.

Hanceville stony fine sandy loam.—In a virgin state the surface layer of Hanceville stony fine sandy loam is brownish-gray fine sandy loam darkened slightly in the topmost inch with organic matter. At a depth of about 4 inches the surface layer is underlain by reddish-brown or reddish-yellow fine sandy loam or very fine sandy loam, which grades, at a depth of about 16 inches, into brownish-red or yellowish-red loam. At a depth ranging from 20 to 40 inches the

material rests on ferruginous sandstone interstratified with a smaller amount of shale. Numerous slabs and fragments of sandstone are scattered over the surface and are embedded through the soil mass, increasing in number as bedrock is approached. There are many outcrops of sandstone.

About one-half of a square mile of rough stony land (Hanceville soil material) and 1½ square miles of Hanceville stony fine sandy loam, steep phase, on the east slope of White Oak Mountain, and a small area of the rough stony land on a ridge northeast of Houston Valley School, are included with Hanceville stony fine sandy loam on the map. These inclusions resemble Hanceville stony fine sandy loam in the succession of soil layers and soil material but differ from it in occurring on steeper slopes and in having more and larger outcrops of rocks as well as more and larger rock fragments on the surface. On the east side of White Oak Mountain and Taylor Ridge are many small areas, totaling about one-third of a square mile, of steep and stony phases of Tellico fine sandy loam, which also are included in areas mapped as Hanceville stony fine sandy loam. They resemble Tellico fine sandy loam in having brown surface soils and yellowish-red subsoils, but the organic layer is thinner, fragments of sandstone are larger and more numerous throughout the soil profile, and the underlying formation of ferruginous sandstone is nearer the surface.

Hanceville stony fine sandy loam occupies principally the west slopes of White Oak Mountain and Taylor Ridge. Its slope ranges from 30 to 60 percent. Because of its pervious character and steep slope, drainage is good to excessive. Rain water is quickly absorbed, but the moisture-holding capacity of the soil is low.

This soil is not cultivated, but about 5 percent of it, which occurs on the west basal slope of White Oak Mountain, is used for pasture. The rest is covered with hardwood and some pine. Recommendations for forest appear in the section on Land Uses and Soil Management.

Rough stony land (Muskingum soil material).—Rough stony land (Muskingum soil material) has the same general distribution as Muskingum stony fine sandy loam, but it occurs in rougher, steeper, and more rocky areas. The gradient ranges from 30 to more than 60 percent. As mapped, this soil condition comprises many small areas of Muskingum stony fine sandy loam and Hanceville stony fine sandy loam, the latter occurring particularly on the lower slopes.

This land is not so well suited to forestry as are other forest lands of the county, because the large boulders and rock outcrops are so numerous and the bedrock so near the surface that the growth of trees is sparse and stunted. Furthermore, it is difficult to harvest timber from land where the relief is so broken and steep. The extension forester for the University of Georgia, College of Agriculture, recommends that, under such conditions, the natural reproduction of trees should take its course, but it is essential to protect the forest from fires. Further recommendations for forest are given by the extension forester in the section on Land Uses and Soil Management.

LAND USES AND SOIL MANAGEMENT

According to the United States census for 1935, there are 108,160 acres of land in Catoosa County, of which 84,741 acres are in farms. Of these, in that year, 26,043 acres were in crops, 12,494 acres were idle, 10,673 acres were in pasture, 30,846 acres were in woodland, and 4,685 acres included all other land in farms. Almost all of the idle and pasture land was once cultivated, but owing to uncontrolled erosion, the surface soils have washed away and the soils have become unproductive. According to old settlers, under the system of management practiced 50 years ago, steep or hilly erodible lands were cleared and cultivated. Within a decade or less, all or most of the surface soil was washed away, whereupon such lands were abandoned and more land was cleared.

As the soils of this county were developed under forest conditions, where there was only a sparse growth of shallow-rooted grasses, the virgin soils are low in organic matter. This fact, together with the failure to incorporate enough organic matter by applying stable litter or growing green-manure crops, has left most of the land extremely deficient in organic matter and low in available plant nutrients.

To build up and maintain the productivity of these lands the system of management must recognize soil characteristics and soil conditions in view of their natural adaptations to the principal crops. It must include the preservation of lands from erosion throughout the year by the use of terraces and close-growing crops planted so as to give the maximum protection from erosion, and the plowing under of winter and summer legumes to increase the content of organic matter and nitrogen.

All the soils in Catoosa County range from slightly acid to strongly acid.

Table 6 gives the pH values[8] of the important soils in the county.

TABLE 6.—*pH determinations*[1] *on several soils from Catoosa County, Ga.*

Soil type and sample No.	Depth	pH
	Inches	
Roane silt loam:		
259801	0–6	5.9
259802	7–14	5.7
259803	15–30	6.3
259804	31–40+	6.5
Clarksville cherty silt loam:		
259805	0–1	6.1
259806	2–8	5.6
259807	9–15	5.1
259808	16–36	4.6
259809	37–48+	4.3
Apison very fine sandy loam, deep phase:		
259813	0–7	5.8
259814	8–14	4.9
259815	15–21	4.8
259816	22–30	4.5
259817	31–42+	4.6
Sequatchie fine sandy loam:		
259818	0–9	5.7
259819	10–16	4.7
259820	17–24	4.9
259821	25–38	4.9
259822	39–48	4.8
Colbert silt loam:		
259828B	0–6	5.5
259829	7–13	4.8
Colbert silt loam—Continued.	*Inches*	
259830	14–22	4.7
259831	23–34	4.7
259832	35–42	7.8
259833	43–46+	------
Talbott silt loam:		
259839	0–8	5.7
259840	9–16	5.8
259841	17–26	5.5
259842A	27–34	5.0
259842B	35–40+	4.6
Wolftever silt loam:		
259843	0–6	5.0
259844	7–14	4.4
259845	15–20	4.4
259846	21–30	4.4
259847	31–48	4.4
Jefferson fine sandy loam:		
259854	0–8	4.6
259855	9–18	4.6
259856	19–30	4.7
259857	31–48	4.4
Pope silt loam:		
259858	0–18	5.1
259859	19–36+	4.6

[1] These determinations were made by E. H. Bailey, in the laboratories of the Bureau of Plant Industry, by the hydrogen-electrode method.

[8] See footnote 7, p. 9.

It is true, to a marked degree, that soil characteristics and soil conditions have determined the present agricultural practices. For example, the well-drained warm early upland and terrace lands are used for cotton and truck crops, the moderately to well-drained lands of the stream flood plains for corn and hay, and the heavy silt loams of the uplands with a clay or silty clay subsoil for corn, hay, and livestock raising. On the other hand, many farmers are attempting to cultivate eroded lands that are physically best suited for pasture or reforestation. Many farmers fail to mature their cotton before boll-weevil infestation, because the soil has a heavy impervious subsoil and does not become warm until late in the spring. A third group of farmers are cultivating slopes that are entirely too steep for tillage or are not adequately protected against erosion. Although a substantial step has been made by some progressive farmers toward carefully selecting the soil for the crop, the average farmer does not well adjust his farming methods to the limitations of his soils, either because he is unable to do so economically or because he does not appreciate the limitations of his land. A full appreciation of the potential productivity of his land cannot be had until he builds terraces on erodible slopes, practices deep contour plowing, grows cover crops, maintains sods to control washing, installs ditches or tile in his poorly drained lands, and through proper rotations increases very materially the organic-matter content of his soils.

Organic matter, well incorporated in the soil, increases its moisture-absorbing and moisture-holding capacities, retards loss of moisture by surface evaporation, improves the tilth by making heavy soils more open, so they will not be so likely to puddle or run together, and, by filling interstices of sandy soils, holds them in place and decreases leaching. It will help to control erosion by binding soil particles and absorbing moisture that would otherwise run off over the surface. In decomposing, it supplies nitrogen and liberates other plant nutrients. In the green condition, organic matter is actively decomposing, whereas old dry plants resist decomposition for years. Thus, it is important that the supply be in the form of either stable manure or green-manure crops. If the latter, the plants impede run-off, their shade retards evaporation, and their roots keep soil particles in place.

CULTIVATED CROPS AND PASTURE

Extensive tracts of heavier textured soils, naturally suited for pasture, are now idle or in cotton, which matures too late to escape the depredations of the boll weevil. These tracts could be utilized profitably for the production of dairy and beef products. The county agent states that the highest incomes are realized on farms where the soils are comparatively heavy textured and the production of corn and hay in conjunction with raising dairy or beef cattle is the type of agriculture pursued. Furthermore, a substantial tendency on the part of farmers in this direction is evidenced by a marked increase in cattle on farms from 1930 to 1935, according to census figures. The experience of farmers within the county has fully demonstrated that more and better cattle, on the heavier soils, are profitable. To continue this development constructively, more and better feed crops are necessary. For this purpose a representative of the University of Georgia, College of Agriculture, and the county agent of Catoosa County, Ga., report that such soils as Colbert silt loam and Talbott silt loam

are too heavy and too late for cotton but are especially adapted to forage and pasture. A suitable rotation would be to follow a winter legume with corn interplanted with cowpeas or soybeans and small grain, and to follow this with cowpeas, soybeans, or lespedeza. For such lands a permanent pasture of lespedeza, clovers, timothy or herd's-grass, Bermuda grass, and Dallis grass is advised; but on Colbert silty clay loam, rolling stony land (Colbert soil material), Fullerton cherty silt loam, eroded phase, Dandridge silt loam, and Apison very fine sandy loam, all of which are nonarable but will afford pasture, the clovers should be omitted. The soils of the stream flood plains, such as Atkins silt loam and the more poorly drained parts of Philo silt loam and Melvin silty clay loam, are primarily pasture soils, and they are well adapted to timothy and alsike clover. Probably 70 percent of these potential pasture lands, with a total area of about 30 square miles, are either in forest or in idle and abandoned fields covered with brush, briers, wild grasses, and sedges. To improve these, in order that the better pasture grasses, such as those previously mentioned, can be grown, it would be necessary to thin the trees and remove the brush, thereby allowing the sunshine to reach the ground.

Where gullying and sheet erosion are serious, kudzu would afford protection and would do much toward reclamation. With its large rooting system and heavy growth of vines, kudzu not only checks washing but, by holding the sediments washed into gullies, causes them to fill. Honeysuckle grows well in gullies in this section and affords a natural control for erosion. When kudzu is planted on gentle slopes that extend downward to steeper slopes, it is particularly effective in preventing the beginning of gully and sheet erosion. To prevent erosion and loss of plant nutrients by leaching, cultivated soils should be used continuously; that is, some cover crop should be grown every winter, and when not planted to cultivated crops the land either should be in sod for permanent pasture or should be reforested.

The county agent and leading farmers maintain that an application of 20 to 30 pounds of triple superphosphate and 1 to 3 tons of pulverized limestone every 4 or 5 years should be made for cover crops, especially for lespedeza.

Lands with well-drained pervious surface soils, subsoils, and substrata, such as Clarksville cherty silt loam and its smooth phase, Fullerton silt loam of the uplands, Allen very fine sandy loam, Apison very fine sandy loam, deep phase, Waynesboro very fine sandy loam, Cumberland very fine sandy loam, Sequatchie fine sandy loam, and Jefferson fine sandy loam of the terraces, are considered by a representative of the University of Georgia, College of Agriculture, and the county agent of this county to be well adapted to cotton and truck crops. These specialists suggest a rotation consisting of cotton, followed by winter legumes, and these turned under for corn interplanted with cowpeas or soybeans and small grain with lespedeza. Grasses, such as Bermuda grass and lespedeza, grow well on all these terrace lands. For Tellico fine sandy loam they advise truck crops, but, owing to its occurrence on slopes ranging as high as 30 percent, it is thought best to alternate strips of leguminous soil-building crops with the truck crops, in addition to terracing. They suggest corn and grass for Pope silt loam, Pope fine sandy loam, Roane silt loam, and the better drained Philo silt loam. For these soils they recommend a rotation of 2 years of corn interplanted with summer legumes

and 3 years of grass and lespedeza. A meadow mixture of timothy, white clover, and alsike clover is thought best. Where overflow occurs, considerable lespedeza seed will wash away and the voluntary reseeding will be seriously handicapped.

According to records of the cooperative work carried on by the Tennessee Valley Authority and the Georgia Extension Service in Catoosa County, after the first application of 100 pounds of triple superphosphate and 300 pounds of ground limestone per acre, the yields of general farm crops on certain soils showed a marked increase as follows: On Colbert silt loam, 50 percent; on Waynesboro very fine sandy loam, 40 percent; on Clarksville cherty silt loam, smooth phase, 40 percent; and on Sequatchie fine sandy loam, 40 percent.

In Catoosa County the degree to which a farmer provides his family's subsistence directly from his farm indicates in most instances his success as a farmer. The county agent states that a family of 5 should plant about one-half acre in a home garden and have 2 acres in truck patches. These will provide about 450 pounds of tomatoes, 850 pounds of potatoes, 100 pounds of dried peas and beans, and 825 pounds of other vegetables. The subsistence orchard should have 4 apple, 4 peach, 4 pear, and 6 fig trees, 15 grapevines and 15 berry vines, and 500 strawberry plants.

FORESTS

About one-fourth of the land of Catoosa County is naturally adapted to no other use than forest. This comprises all the Fifth-class soils—rough stony land (Muskingum soil material), Muskingum stony fine sandy loam, Hanceville stony fine sandy loam, and the hill and steep phases of Clarksville cherty silt loam. These lands are very pervious and stony, occur on steep slopes, are comparatively light textured, and tend to be droughty. In addition, considerable acreages of the soils in other groups—perhaps as much as one-fourth of the area of the county—are better adapted to forest and pasture than to cultivated crops.

According to field observations made in Catoosa County by the extension forester of the University of Georgia, College of Agriculture, the dominant tree growth on Peavine Ridge and other chert ridges of the county is post oak (*Quercus stellata* Wang.), blackjack oak (*Q. marilandica* Muench.), southern red oak or Spanish oak (*Q. falcata* Michx., *Q. ruba* L.), mockernut or white hickory (*Carya tomentosa* (Lam.) Nutt.), pignut (*C. glabra* (Mill.) Sweet), and shortleaf pine (*Pinus echinata* Mill.). Trees of less importance are scarlet oak (*Q. coccinea* Muench.), northern red oak (*Q. borealis* Michx. f.), black oak or yellow oak (*Q. velutina* Lam.), sweetgum (*Liquidambar stryaciflua* L.), tupelo or black gum (*Nyssa sylvatica* Marsh.), winged elm (*Ulmus alata* Michx.), flowering dogwood (*Cornus florida* L.), sourwood (*Oxydendrum arboreum* (L). DC.), common persimmon (*Diospyros virginiana L.*), and red maple (*Acer rubrum* L.). On the steep western slopes of Taylor Ridge and White Oak Mountain, occupied by Hanceville stony fine sandy loam, Muskingum stony fine sandy loam, and rough stony land (Muskingum soil material), chestnut oak (*Quercus montana* Willd.), and shortleaf pine are most common; but other trees present are scrub pine or Virginia pine (*P. virginiana* Mill.), loblolly pine(*P. taeda* L.), tuliptree (*Liriodendron tulipifera* L.), sourwood, black gum, white oak (*Q. alba* L.), yellow oak, white-

hickory, pignut, shagbark hickory (*Carya ovata* (Mill.) K. Koch, commonly called scaly-bark), red maple, silver maple (*Acer saccharinum* L.), winged elm, black cherry (*Prunus serotina* Ehrh.), white ash (*Fraxinus americana* L.), common locust or black locust (*Robinia pseudoacacia* L.), eastern redcedar (*Juniperus virginiana* L.), eastern redbud (*Cercis canadensis* L.), and dogwood. Occupying the eastern slopes of Taylor Ridge and White Oak Mountain are the hill and steep slopes of Apison very fine sandy loam. Here are shortleaf, loblolly, and Virginia pines; white, post, chestnut, scarlet, southern red, and yellow oaks; white hickory, pignut, black gum, tuliptree, redbud, sourwood, persimmon, and black locust. White oak predominates.

On crop and pasture lands, the extension forester also observed the following trees: As dominant growths on Apison very fine sandy loam, shortleaf pine, black oak, and white oak; but of less importance are scarlet, southern red, yellow, and northern red oaks, red maple, black cherry, white hickory, sourwood, dogwood, loblolly pine, tuliptree, winged elm, black gum, sweetgum, and red mulberry (*Morus rubra* L.).

In the western part of the county and in the valley immediately west of White Oak Mountain and Taylor Ridge, where the limestone is near the surface, as in Colbert silty clay loam and rolling stony land (Colbert soil material), post and white oaks predominate; but blackjack oak, black locust, and redcedar are common; and yellow oak, southern red oak, and overcup oak (*Quercus lyrata* Walt.), shortleaf pine, persimmon, shagbark hickory, mockernut, pignut, redbud, hackberry (*Celtis* spp.), and red mulberry are present. On Colbert silt loam and Talbott silt loam the main trees are black oak and hickories, and there are some shortleaf and loblolly pines, post, southern red, and blackjack oaks, white ash, American beech (*Fagus grandifolia* Ehrh.), sweetgum, and American or white elm (*Ulmus americana* L.).

On Pope silt loam, Roane silt loam, and the better drained Philo silt loam, the extension forester observed such trees as white and winged elms, white and southern red oaks, American sycamore or American planetree (*Platanus occidentalis* L.), sweetgum, black gum, loblolly pine, tuliptree, black willow (*Salix nigra* Marsh.), and black walnut (*Juglans nigra* L.).

Almost all of the timberland is burned over each year. According to the extension forester, burning destroys natural reproduction and organic matter, severely injures trees of 15 to 20 inches in diameter by burning the cambium, thereby subjecting them to the infestation of insects and to plant diseases, and retards the development of larger trees. Pine straw has a value of $3 a ton in plant nutrients, and leaves of hardwoods have a higher value. Reseeding on thinly covered mountaintops, ridges, or steep valley slopes will take place naturally if a seed tree is within a quarter of a mile. If artificial reforestation is used, loblolly pine, red cedar, and black locust are recommended. Black locust is one of the most durable woods for fence posts. Where too thick, if the young trees are thinned during the dormant season, the growth, in many places, could be stimulated as much as 130 percent.

A serious practice is to cut the trees when too small. No tree of less than 15 inches in diameter (breast high) should be cut, and one or more seed trees should be left on each acre.

PRODUCTIVITY RATINGS AND LAND CLASSIFICATION

In table 7 the soils of Catoosa County are listed alphabetically and estimated average acre yields of the principal crops are given for each soil.

TABLE 7.—*Estimated average acre yields of the principal crops on each soil in Catoosa County, Ga.*[1]

Soil (soil types, phases, and land types)[2]	Lint cotton		Corn		Wheat		Lespedeza		Truck		Pasture (pounds of beef produced per acre per year)[5]
	A[3]	B[4]	A	B	A	B	A	B	A	B	
	Lb.	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*			
Allen very fine sandy loam	250	350	18	35	9	18	0.80	1.50	Fair	Good	350
Apison very fine sandy loam	170	250	10	20	7	15	.50	1.00	Poor	Fair	240
Apison very fine sandy loam, deep phase	250	350	15	32	9	16	.80	1.50	Fair	Good	340
Apison very fine sandy loam, eroded slope phase	125	150	8	14	7	12	.30				200
Atkins silt loam			8	[6] 40			1.00				350
Clarksville cherty silt loam	240	350	14	25	8	15	.50	1.25	Fair to poor.	Fair to good.	240
Clarksville cherty silt loam, smooth phase	250	400	16	30	8	15	.60	1.50	Fair	Good	300
Clarksville cherty silt loam, hill phase											200
Clarksville cherty silt loam, steep phase											
Colbert silt loam	250	350	16	28	10	18	.75	1.50	Fair	Fair to good.	350
Colbert silt loam, slope phase											265
Colbert silty clay loam	200	250	12	20	7	12	.50	1.00			275
Colbert silty clay loam, slope phase											250
Cumberland very fine sandy loam	300	500	20	35	9	18	.80	1.50	Fair	Good	300
Dandridge silt loam	125	175	8	14	8	14	.30	1.00			300
Fullerton silt loam	275	450	17	32	10	18	.75	1.50	Fair	Good	350
Fullerton cherty silt loam, eroded phase	200	300	13	25	8	14	.30	1.50	Poor	Fair to good.	300
Greendale cherty silt loam	325	500	17	35	12	20	.50	1.25	Fair	Good	375
Hanceville stony fine sandy loam											
Jefferson fine sandy loam	200	300	15	30	8	18	.60	1.25	Fair	Good	300
Melvin silty clay loam			8	[6] 50			1.00				375
Muskingum stony fine sandy loam											
Philo silt loam			25	[6] 40			1.25	1.75			325
Pope fine sandy loam	270	300	22	40			.80	1.50	Fair	Good	300
Pope silt loam	300		30	50	10	20	1.25	2.00	Fair to good.	do	450
Roane silt loam	250	350	20	35			.80	1.50	Fair	do	300
Rolling stony land (Colbert soil material)											250
Rough stony land (Muskingum soil material)											
Sequatchie fine sandy loam	275	400	17	35	9	20	.80	1.50	Fair	Good	300
Talbott silt loam	250	350	21	35	11	20	1.00	1.75	do	do	350
Tellico fine sandy loam	250	350	20	35	12	15	.70	1.50	Fair to good.	Very good.	300
Waynesboro very fine sandy loam	300	375	18	40	10	20	.70	1.50	Fair	Good	300
Waynesboro very fine sandy loam, eroded phase	200	300	13	25	8	15	.50	1.25	Poor	Fair	250
Wolftever silt loam	300	375	20	40	8	18	1.00	1.50			350

[1] Estimates have been compiled from data obtained from farmers, the county agent, the assistant county agent, and the assistant project leader of the Georgia Mountain Branch Station of the Georgia Agricultural Experiment Station.
[2] The soils are listed in alphabetical order.
[3] Average crop obtained under prevailing practices.
[4] Average crop obtained with improved methods of soil management.
[5] These estimates are for pasture after treatment with lime and phosphate.
[6] Improvements include adequate drainage. The practicability of drainage, however, depends upon size and shape of area and use of land.

The estimates in table 7 are based primarily on interviews with farmers, the county agent and his assistant, members of the staff of the Georgia Mountain Branch Station of the Georgia Agricultural Experiment Station, cooperating with the University of Georgia, College of Agriculture, and others who have had experience in the agriculture of Catoosa County. They are presented only as estimates of the average production over a period of years, according to two broadly defined types of management. It is realized that they may not apply directly to specific tracts of land for any particular year, as the soils shown on the map vary somewhat, management practices differ slightly, and climatic conditions fluctuate from year to year. On the other hand, these estimates appear to be as accurate as can be obtained without further detailed and lengthy investigations, and they serve to bring out the relative productivity of the soils shown on the map.

No numerical estimates of yields are given for truck crops because of limited information as to yields of the individual kinds of vegetables from the small fields on which they are grown. Descriptive terms to bring out differences in productivity are used. The productivity for pasture is given in pounds of beef produced per acre per year after treatment of the pasture with phosphate and lime.

The numbers in the column headed "A" under each crop indicate yields obtained under the prevailing practices, which, on most of the soils, include the use of small to moderate quantities of commercial fertilizers, but which generally do not include careful and intensive practices of soil management in regard to the control of erosion, the incorporation of organic matter, and the maintenance and increase of soil fertility and soil productivity. In the column headed "B," yields under more careful and intensive practices are given. These practices consist of a regular crop rotation including the growing of legumes, the use of barnyard and green manures, the application of lime and liberal quantities of suitable commercial fertilizers, the use of improved varieties and high-quality seed, and, where needed, the use of mechanical measures, such as contour tillage, strip cropping, and terracing or constructing diversion ditches for the control of erosion. In the poorly drained soils of the bottoms—the Melvin and Atkins soils—artificial drainage is provided.

In order to compare directly the yields obtained in Catoosa County with those obtained in other parts of the country, yield figures have been converted in table 8 to indexes based on standard yields. The soils are listed in the approximate order of their general productivity under prevailing farming practices, the most productive first.

The rating compares the productivity of each of the soils for each crop to a standard, namely, 100. This standard index represents the approximate average acre yield obtained without the use of amendments on the more extensive and better soil types of the regions of the United States in which the crop is most widely grown. An index of 50 indicates that the soil is about half as productive for the specified crop as is the soil with the standard index. Soils given amendments, such as lime and commercial fertilizers, or special practices, such as irrigation, and unusually productive soils of small extent, may have productivity indexes of more than 100 for some crops.

TABLE 8.—*Productivity ratings of the soils of Catoosa County, Ga.*

Soil (soil types, phases, and land types) [1]	Crop productivity index [2] for—										Pasture (pounds of beef per acre per year) [4]	General productivity		
	Cotton (400 lbs.=100)		Corn (50 bu.=100)		Wheat (25 bu.=100)		Lespedeza (1.5 T.=100)		Truck [3]			Grade [5]		Group [6]
	A	B	A	B	A	B	A	B	A	B		A	B	
Pope silt loam	75		60	100	40	80	85	133	Fair to good	Good	450	4	1	Moderately high.
Cumberland very fine sandy loam	75	125	40	70	35	70	55	100	Fair	do	300	4	2	
Tellico fine sandy loam	62	87	40	70	47	60	47	100	Fair to good	Very good	300	4	2	
Greendale cherty silt loam	80	125	35	70	47	80	32	83	Fair	Good	375	4	2	
Waynesboro very fine sandy loam	75	95	35	80	40	80	47	100	Fair	Good	300	5	2	Medium.
Wolftever silt loam	75	95	40	80	32	72	67	100			350	5	2	
Roane silt loam	62	87	40	70			55	100	Fair	Good	300	5	2	
Sequatchie fine sandy loam	70	100	35	70	35	80	55	100	do	do	300	5	2	
Apison very fine sandy loam, deep phase	62	87	30	65	35	65	55	100	do	do	340	5	2	
Allen very fine sandy loam	62	87	35	70	35	72	55	100	do	do	350	5	2	
Fullerton silt loam	70	112	35	65	40	72	50	100	do	do	350	5	2	
Philo silt loam			50	[7] 80			85	115			325	5	2	
Clarksville cherty silt loam, smooth phase	62	100	32	60	35	60	40	100	Fair	Good	300	5	2	
Talbott silt loam	62	87	42	70	45	80	67	115	do	do	350	5	2	
Pope fine sandy loam	67	75	45	80			55	100	do	do	300	5	2	
Clarksville cherty silt loam	60	87	27	50	32	60	32	83	Fair to poor	Fair to good	240	6	3	Medium to low.
Colbert silt loam	62	87	32	55	40	72	50	100	Fair	do	350	6	4	
Jefferson fine sandy loam	50	75	30	60	32	72	40	83	do	Good	300	6	4	
Waynesboro very fine sandy loam, eroded phase	50	75	25	50	32	60	32	83	Poor	Fair	250	7	4	
Apison very fine sandy loam	42	62	20	40	27	60	32	67	do	do	240	7	5	
Fullerton cherty silt loam, eroded phase	50	75	25	50	32	55	20	100	do	Fair to good	300	7	5	
Atkins silt loam			15	[7] 80			67				350	7	2	
Melvin silty clay loam			15	[7] 100			67				375	7	2	
Colbert silty clay loam	50	62	25	40	27	47	32	67			275	7	6	
Dandridge silt loam	30	45	15	27	32	55	20	67			300	8	7	
Apison very fine sandy loam, eroded slope phase	30	37	15	27	27	47	20				200	8	7	

Colbert silt loam, slope phase											265	9		Low.
Colbert silty clay loam, slope phase											250	9		
Rolling stony land (Colbert soil material)											250	9		
Clarksville cherty silt loam, hill phase											200	10		Very low.
Clarksville cherty silt loam, steep phase												10		
Hanceville stony fine sandy loam												10		
Muskingum stony fine sandy loam												10		
Rough stony land (Muskingum soil material)												10		

[1] The soils are listed in the approximate order of their general productivity under the prevailing practices of soil management, the most productive first.

[2] The soils are given indexes that indicate the approximate average production of each crop in percent of the standard of reference. The standard represents the approximate average yield obtained without the use of amendments on the more extensive and better soil types of those regions of the United States in which the crop is most widely grown. The indexes are based largely on estimates of yields (see table 7), as yield data are too fragmental to be adequate. Indexes in column A refer to average yields obtained under prevailing practices, whereas those in column B refer to average yields obtained under improved methods of soil management, which include crop rotations, practices for the control of erosion, and the use of legumes, commercial fertilizers, lime, barnyard manure, and green manures.

[3] Data are not sufficient to justify giving indexes for truck. The terms used to describe productivity have local rather than national meaning.

[4] These estimates are for pasture after treatment with lime and phosphate. They are based largely on data furnished by the county agent and the Georgia Mountain Branch Station of the Georgia Agricultural Experiment Station.

[5] These numbers indicate the general productivity of the soils for the common crops under two general levels of management. Refer to the text for further explanation.

[6] This is a grouping of soils on the basis of general productivity for the common crops, for purposes of broad comparisons.

[7] These indexes for improved practices include adequate drainage. The practicability of drainage, however, depends on the size and shape of areas and use of the land.

NOTE.—Absence of an index indicates that the crop is not commonly grown.

The following tabulation sets forth some of the acre yields that have been set up as standards of 100. They represent long-time average yields of crops of satisfactory quality.

Crop:		
Corn	bushels	50
Cotton	pounds of lint cotton	400
Wheat	bushels	25
Lespedeza	tons	1½

The principal factors affecting the productivity of land are climate, soil (this includes the many physical, chemical, and biological characteristics), slope, drainage, and management, including the use of amendments. No one of these factors operates separately from the others, although some one may dominate. In fact, the factors listed may be grouped simply as the soil factor and the management factor, as slope, drainage, and most of the aspects of climate may be considered characteristics of a given soil type, since the soil type, as such, occupies specific geographical areas characterized by a given range of slope and climatic conditions. Crop yields over a long period of years furnish the best available summation of the associated factors and, therefore, are used where available. In Catoosa County many of the indexes are based on estimated yields rather than on actually reported yields, although the benefit of the experiences of farmers, the county agent, the assistant county agent, and members of the Georgia Agricultural Experiment Station, cooperating with the College of Agriculture, were had.

The soils are listed in table 8 in the order of their general productivity according to the prevailing practices (indexes in column A). General productivity grade numbers are assigned in the column "General productivity, Grade" for indexes under both A and B. The general productivity grade is based on a weighted average of the indexes for the various crops, the weighting depending on the relative acreage and value of crop. If the weighted average is between 90 and 100, the soil type is given a grade of 1; if it is between 80 and 90, a grade of 2 is given, and so on. Since it is difficult to measure mathematically either the exact significance of a crop in the agriculture of an area or the importance or suitability of certain soils for particular crops, no precise calculations of weighted percentages are made to determine either the order of placement or the general productivity grade for the soils in Catoosa County. Land use, as expressed by the approximate percentages of the cropped area of a soil used for the individual crops, however, is used as a guide in roughly weighting the crop indexes. Thus, the index for cotton on Pope silt loam is given a weighting of 10, whereas on Cumberland very fine sandy loam the index for cotton carries a weight of 55.

The right-hand column of table 8, "General productivity, Group," is a broad grouping to bring out the relative productivity of the soils of Catoosa County.

Productivity tables do not present the relative roles that soil types, because of their extent and the pattern of their distribution, play in the agriculture of the county. The tables show the relative productivity of individual soils. They cannot picture in a given county the total quantitative production of crops by soil areas without the additional knowledge of the acreage of the individual soil types devoted to each of the specified crops.

Economic considerations play no part in determining the crop productivity indexes. Such indexes cannot be interpreted, therefore, into land values except in a very general way. Distance to market, relative prices of farm products, and other factors influence the value of land. It is important to realize that productivity, as measured by yields, is not the only consideration that determines the relative worth of a soil for growing crops. The ease or difficulty of tillage and the ease or difficulty with which productivity is maintained are examples of considerations other than productivity that influence the general desirability of a soil for agricultural use. In turn, steepness of slope, presence or absence of stone, the resistance to tillage offered by the soil because of its consistence or structure, and the size and shape of areas are characteristics of soils that influence the relative ease with which they can be tilled. Likewise, inherent fertility and susceptibility to erosion are characteristics that influence the ease of maintaining soil productivity at a given level. Productivity, as measured by yields, is influenced to some degree by all these and other factors, such as moisture-holding capacity of the soil and its permeability to roots and water; and so they are not factors to be considered entirely separately from productivity; but, on the other hand, schemes of land classification to designate the relative suitability of land for agricultural use must give some separate recognition to them. Table 9 gives some of these charactertistics for the soils of Catoosa County and summarizes their relative suitability for land use in a simple grouping.

In the column headed "Soil groups or land classification," the soils are grouped according to their comparative desirability or physical suitability for crop growing, grazing, or forestry.

The best soils of this county, classified as Second-class soils, are considered good to fair cropland. In general, they are capable of medium to moderately high production of the common crops under good soil-management practices; they are rather easily worked; and it is not especially difficult to maintain productivity. These soils are so desirable for crops that probably more than four-fifths of their total acreage is used for cultivated crops, despite the fact that they constitute some of the best pasture and woodland in the county. They have not been considered First-class soils, because their inherent fertility is not equal to that of such soils as the Huntington and Decatur of the Tennessee Valley.

Third-class soils are considered fair to poor cropland. They are of medium to low productivity and generally occur on more sloping land than do the Second-class soils. As a result, they are, for the most part, more difficult to till and to protect against loss from erosion.

The Fourth-class soils as a group are more difficult to till, either because of increased slope, impervious subsoils, or stoniness, are lower in productivity, and have experienced more erosion than the Third-class soils. Most of them, because of a fair degree of fertility and moisture-holding capacity, can be managed so as to be fair to good pasture land. The Atkins and Melvin soils need artificial drainage to be productive for tilled crops, but in their undrained condition they can be made very productive of pasture grasses. On most farms these soils are used to good advantage for pasture. The distribution of these soils in relation to either better or poorer soils on any farm,

TABLE 9.—*Characteristics that influence the suitability of soils for growing crops in Catoosa County, Ga.*

Soil (soil types, phases, and land types)	Inherent fertility	Workability	Erodibility if tilled	Surface drainage	Internal drainage	Available water supply for plants	Productivity under common practices	Soil groups or land classification
Pope silt loam	Medium to fairly high.	Very good	Very low, if any; some deposition.	Slow	Medium	High	Moderately high.	Second-class soils (good to fair cropland; also capable of supporting good to fair pasture).
Cumberland very fine sandy loam	do	do	Moderate	Medium	do	do		
Tellico fine sandy loam	Medium	Good	do	Rapid	Rapid	do		
Greendale cherty silt loam	do	do	Low	Medium	Medium	Medium		
Waynesboro very fine sandy loam	Medium to low	do	Moderate	do	do	do	Medium	
Wolftever silt loam	Medium	Medium	Low	do	Slow	do		
Roane silt loam	Medium to low	Good	Very low, if any; some deposition.	Slow	do	do		
Sequatchie fine sandy loam	Medium	Very good	Low	Medium	Rapid	do		
Apison very fine sandy loam, deep phase	Low	Good	Moderate	do	Medium	do		
Allen very fine sandy loam	Medium	do	do	Rapid	Rapid	do		
Fullerton silt loam	do	do	do	do	Medium	High		
Philo silt loam	Medium to fairly high.	Very good	Very low, if any; some deposition	Slow	Slow	do		
Clarksville cherty silt loam, smooth phase	Medium to low	Good	Moderate	Medium	Medium	Medium		
Talbott silt loam	Medium to fairly high.	Medium	do	do	Slow	High		
Pope fine sandy loam	Medium	Very good	Very low, if any; some deposition.	Slow	Medium	Medium		
Clarksville cherty silt loam	Medium to low	Medium	Moderate	Rapid	Medium	Medium	Medium to low.	Third-class soils (fair to poor cropland; also capable of supporting good to fair pasture).
Colbert silt loam	Medium	do	do	Medium	Very slow	do		
Jefferson fine sandy loam	Low	Good	do	Rapid	Rapid	Low		
Waynesboro very fine sandy loam, eroded phase	do	Medium	Very high	do	Medium	do		
Apison very fine sandy loam	do	do	do	do	do	do		

Fullerton cherty silt loam, eroded phase	Medium to low	Medium	Moderate	Rapid	Medium	Medium	Medium to low.	Fourth-class soils (not well suited for cropping, recommended use is pasture).
Atkins silt loam	Medium to fairly high.	Poor [1]	Very low, if any; some deposition	Very slow	Very slow	High		
Melvin silty clay loam	do	do	do	do	do	do		
Colbert silty clay loam	Medium	Poor	Very high	Medium	do	Low		
Dandridge silt loam	Medium to low	Medium	do	Rapid	Medium	Medium		
Apison very fine sandy loam, eroded slope phase.	Low	Poor	do	do	do	Low		
Colbert silt loam, slope phase	Medium	do	do	do	Very slow	do	Low	
Colbert silty clay loam, slope phase	do	do	do	do	do	do		
Rolling stony land (Colbert soil material)	do	do	do	do	do	do		
Clarksville cherty silt loam, hill phase	Low	Very poor	Very high	Very rapid	Medium	Low	Very low	Fifth-class soils (generally unsuited for cropping or pasture; may be designated as forest land).
Clarksville cherty silt loam, steep phase	do	do	do	do	do	do		
Hanceville stony fine sandy loam	do	do	do	do	Rapid	Very low		
Muskingum stony fine sandy loam	do	do	do	do	do	do		
Rough stony land (Muskingum soil material).	do	do	do	do	do	do		

[1] Natural poor drainage makes these soils difficult to work.

of course, is very influential in determining the best use of any one of these soils on any particular farm.

The Fifth-class soils comprise comparatively rough, stony, and mountainous areas. They are too rugged for pasture, and their best use over a period of years appears to be for forestry.

MORPHOLOGY AND GENESIS OF SOILS

Soil is the product of forces of weathering and soil development on soil materials deposited or accumulated by geologic agencies. The characteristics of the soil at any given point depend on the internal soil climate, the native vegetation, the composition of the parent material, and the length of time the forces of soil development have acted on the soil material. Soil climate, in turn, depends on the usual climatic factors of rainfall, temperature, and humidity, and locally it is greatly modified by relief as affecting drainage, aeration, and run-off.

Catoosa County is located in the extreme northern part of the Red and Yellow Podzolic soils belt and near the extreme southern part of the Gray-Brown Podzolic soils belt in the United States. The soils are typical of those developed in a forested area under the influence of a humid temperate climate where the average annual rainfall of 51.61 inches has been sufficient to compensate for the loss of moisture (through evaporation and surface run-off) and in addition to afford an almost constant supply for downward movement through the soil. The light colors are due largely to the low content of organic matter, and this, in turn, is due to the formation of the soils under a dense forest cover of hardwoods and pines. This was unfavorable for the growth of large grass roots and for the accumulation of organic matter. Furthermore, the high annual precipitation, together with a high temperature during much of the year, has resulted in oxidizing a large part of the organic matter. Therefore, under virgin conditions, the organic layer in few places extends to a depth of more than 2 or 3 inches. Leaching of soluble plant nutrients has been and still is active. It is more active in the more pervious soils, such as the Clarksville, Fullerton, Tellico, Sequatchie, Waynesboro, Allen, and Jefferson. The soils do not freeze below a depth of 3 or 4 inches, and then for a period of only 1 to 5 days about three or four times during the ordinary winter. Consequently, leaching is almost continuous.

The profiles of most of the soils of this county, where soil-forming processes are distinctly expressed, show a translocation of the fine materials and sesquioxides from the A horizon to the B horizon, an increase of silica in the A horizon, and a leaching of carbonates from the solum. Such soils are termed podzolic.

The soils that have developed a normal soil profile and express the climatic influence on the parent material are Clarksville cherty silt loam, smooth phase; Fullerton silt loam; Talbott silt loam; Tellico fine sandy loam; Apison very fine sandy loam, deep phase; Sequatchie fine sandy loam; Waynesboro very fine sandy loam; Cumberland very fine sandy loam; Allen very fine sandy loam; and

Jefferson fine sandy loam. The soils of the Colbert series have been restricted in the development of a normal profile, because of an excess of water that reaches at times the degree of saturation. Profiles of the Muskingum, Hanceville, and Dandridge soils are shallow above bedrock and only partly formed. They may be termed AC soils. Areas mapped as colluvial and alluvial soils have attained no development of a soil profile.

In Catoosa County about 34 percent of the soil material is developed from interstratified sandstone and shale, 24 percent from interstratified limestone and calcareous shale, and 42 percent from beds of chert carrying thin beds of shale. About 30 percent of the soil material has been transported. Of this about 3 percent consists of alluvial fans and colluvial deposits, 12 percent occurs on stream terraces, and 3 percent occurs in flood plains.

The geologic formations, through weathering and soil-forming processes, give rise to soils that differ greatly in their chemical and physical composition. Soils of the Clarksville and Fullerton series are derived mainly from a cherty member of Knox dolomite, and to a less degree from Fort Payne chert; those of the Colbert and Talbott series from Chickamauga limestone, Conasauga interstratified limestone and shale, and Bangor limestone; those of the Tellico series from a red sandstone of the Red Mountain formation; and those of the Apison and Dandridge series from the Rome formation, including Apison shale and Floyd shale underlying Oxford sandstone.

Figure 2 is a geologic map [9] of the Appalachian Valley and Lookout Valley, showing the general occurrences of the above-named formations.

Table 10 gives the derivation of the soils and describes the profiles of certain soils in Catoosa County, Ga.

Second bottoms or terraces, which are composed of old alluvium, have received their materials from soils of the local uplands and local formations. The materials of these soils have lain in place for a sufficient length of time to develop, in some places, a normal soil profile. Such soils are classed as Waynesboro very fine sandy loam, Cumberland very fine sandy loam, Allen very fine sandy loam, and Jefferson fine sandy loam. Partly developed soil materials that occur on comparatively low terraces are classed as Sequatchie fine sandy loam. All these terrace soils are composed of a mixture of materials coming from soils overlying such substrata as limestone, sandstone, shale, and chert. Greendale cherty silt loam has no distinct soil profile and represents an accumulation of materials washed mainly from the Clarksville and Fullerton soils. In the first-bottom areas along the streams no soil profile has developed. Pope silt loam, Pope fine sandy loam, Philo silt loam, and Atkins silt loam represent wash from soils overlying, largely, sandstone, shale, and limestone. Roane silt loam is derived from materials coming from cherty limestone and shale. Melvin silty clay loam has its derivation principally from soils underlain by limestone and shale.

[9] See footnote 5, p. 2.

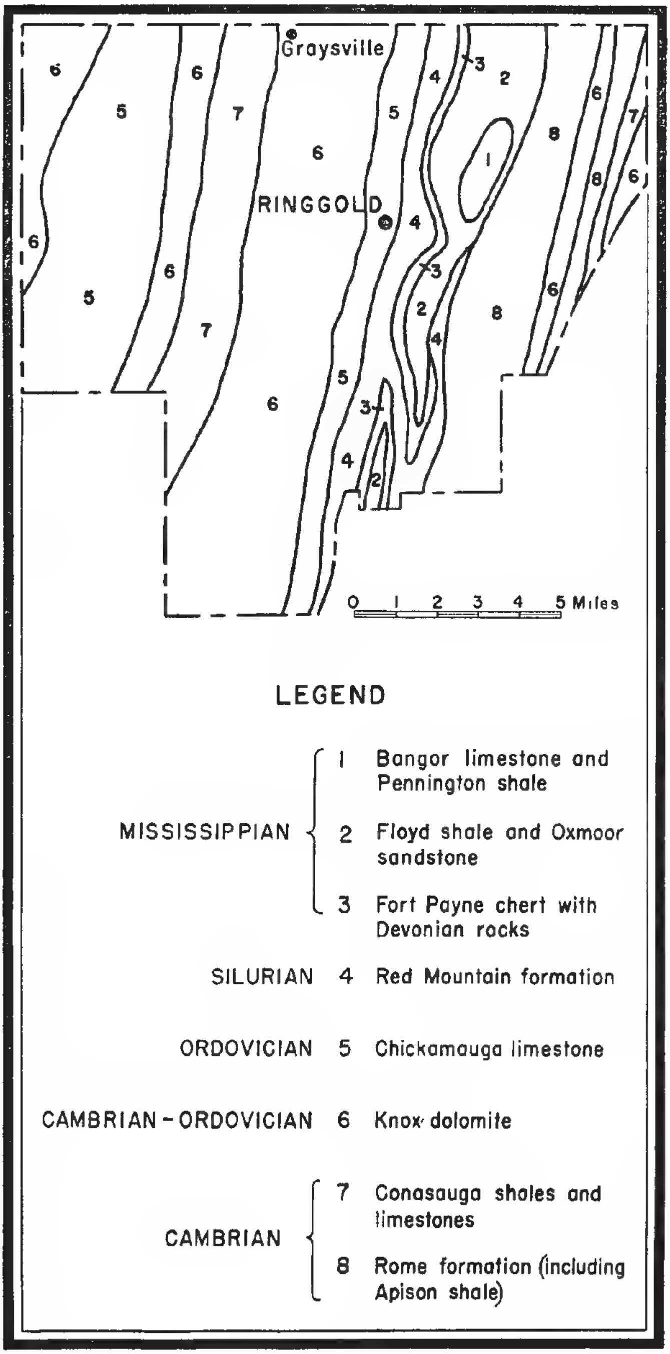


FIGURE 2.—Geologic formations underlying the soils of Catoosa County, Ga.

TABLE 10.—*Parent material, geologic period, and descriptions of profiles of soils in Catoosa County, Ga.*

Soil series	Parent material	Description of profiles		
		A horizon	B horizon	Substratum
Clarksville	Principally Knox dolomite (Cambrian and Ordovician periods); and some Fort Payne chert (Mississippian period).	Light gray to gray	Yellowish gray cherty silty clay loam; very compact in lower part.	Beds of chert from 5 to 20 feet below the surface.
Fullerton	do	Light grayish brown.	Reddish-yellow friable silty clay loam; reddish brown in lower part.	Beds of chert interstratified with red heavy clay about 50 inches below the surface
Colbert	Chickamauga and Bangor limestone (Mississippian period); and some Conasauga interstratified limestone and shale (Cambrian period).	Brownish-gray silt loam	Yellow silty clay	Limestone bedrock from a few inches to 6 feet (averaging about 15 inches) below the surface.
Talbott	Conasauga interstratified limestone and shale (Cambrian period)	Grayish-brown mellow silt loam.	Brownish-yellow silty clay loam with a red hue.	Limestone bedrock from 4 to 7 feet below the surface.
Apison	Rome formation, including Apison shale, Floyd shale, and Oxford sandstone (Cambrian period)	Brownish-gray very fine sandy loam.	Brownish-yellow silty clay loam	Interstratified beds of shale and sandstone about 18 inches below the surface.
Dandridge	do	Pale grayish-yellow silt loam.	Yellow friable silt loam; gray and yellow mottlings below a depth of 13 inches.	Brown calcareous shale about 21 inches below the surface.
Hanceville	Red Mountain formation (Mississippian period).	Brownish-gray or reddish-brown fine sandy loam	Brownish-red loam	Ferruginous sandstone interstratified with thin beds of shale from 20 to 40 inches below the surface.
Muskingum	do	Pale yellowish-gray fine sandy loam.	Yellowish-brown loam	Sandstone interstratified with thin beds of shale from 10 to 12 inches below the surface.
Tellico	do	Brown mellow fine sandy loam.	Yellowish-red fine sandy loam.	Red ferruginous sandstone from 2 to 7 feet below the surface.
Greendale	Colluvial material from Clarksville and Fullerton soils.	Light brownish-gray friable cherty silt loam; some organic matter	Light brownish-gray friable cherty silt loam.	Cherty colluvial material
Allen	Colluvial material from Hanceville, Muskingum, Tellico, and Apison soils.	Brown mellow very fine sandy loam.	Light reddish-yellow or light reddish-brown friable clay.	
Jefferson	do	Grayish-brown fine sandy loam.	Brownish-yellow fine sandy loam in upper part, brownish-yellow compact silty clay loam in lower part.	Roughly stratified friable reddish-brown clay and brown gravelly loam 30 inches below the surface.
Sequatchie	Old alluvium principally from Clarksville, Colbert, Apison, Hanceville, and Muskingum soil materials.	Grayish-brown mellow fine sandy loam.	Yellowish-brown sandy clay loam.	
Waynesboro	do	Grayish-brown mellow very fine sandy loam.	Yellowish-red sandy clay.	
Cumberland	do	Reddish-brown mellow very fine sandy loam.	Red friable firm clay; small rounded fragments of chert, sandstone, and argillite gravel.	

TABLE 10.—*Parent material, geologic period, and descriptions of profiles of soils in Catoosa County, Ga.*—Continued

Soil series	Parent material	Description of profiles		
		A horizon	B horizon	Substratum
Wolftever	Old alluvium principally from Clarksville, Colbert, Apison, Hanceville, and Muskingum soil materials.	Light grayish-brown friable silt loam; many ferruginous or manganese concretions of about buckshot size scattered over surface.	Brownish-yellow silty clay.	
Roane	Recent alluvium largely from Clarksville and Fullerton soil materials.	Light grayish-brown friable cherty silt loam.	Light brownish-gray cherty silt loam.	Light-gray compact chert hardpan 31 inches below the surface.
Melvin	Recent alluvium largely from Colbert and Talbott soil materials.	Gray heavy silt loam; much organic matter.	Gray heavy silty clay; brown and yellow mottlings.	
Pope	Recent alluvium largely from Clarksville, Colbert, Apison, Hanceville, and Muskingum soil materials.	Grayish-brown or yellowish-brown friable mellow silt loam.	Grayish-yellow or brownish-yellow silt loam.	
Philo	do	Grayish-brown mellow silt loam.	Grayish-yellow or light grayish-brown silt loam; gray and brown mottlings below a depth of 23 inches.	
Atkins	do	Gray silt loam	Gray silt loam.	

In tables 11, 12, and 13, respectively, are given the mechanical analysis, chemical analysis, and analysis of the colloids of a sample of Fullerton cherty silt loam from Cherokee County, Ala.[10] This county lies about 50 miles southeast of Catoosa County, Ga. It is believed that the data presented in these tables apply equally well to Fullerton cherty silt loam in Catoosa County.

TABLE 11.—*Mechanical analysis of Fullerton cherty silt loam from Cherokee County, Ala.*

Sample No.	Horizon	Depth	Fine gravel (2–1 mm.)	Coarse sand (1–0.5 mm.)	Medium sand (0.5–0.25 mm.)	Fine sand (0.25–0.1 mm.)	Very fine sand (0.1–0.05 mm.)	Silt (0.05–0.002 mm.)	Clay (<0.002 mm.)	Organic matter by H_2O_2	Material (<0.005 mm.)	pH
		Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	
C-107	A_2	0–9	7.4	5.6	4.3	10.0	11.4	51.1	9.4	0.4	17.5	5.1
C-108	B_1	9–20	4.4	3.0	2.0	3.9	4.8	50.3	31.2	.3	44.2	4.4
C-109	B_2	20–32	1.8	1.2	.6	1.0	2.4	43.3	49.3	.1	57.9	4.4
C-110	B_3	32–53	2.5	2.0	1.0	1.7	3.3	36.5	52.6	.2	61.9	4.4
C-111	C	53–74	5.1	4.7	2.6	3.5	3.2	26.4	54.5	.0	63.9	4.5

[10] ALEXANDER, LYLE T., BYERS, HORACE G., and EDGINGTON, GLEN. A CHEMICAL STUDY OF SOME SOILS DERIVED FROM LIMESTONE. U. S. Dept. Agr. Tech. Bul. 678, 27 pp. 1939.

TABLE 12.—*Chemical composition of Fullerton cherty silt loam from Cherokee County, Ala.*

Sample No.	Horizon	Depth	SiO_2	Al_2O_3	Fe_2O_3	TiO_2	CaO	MgO	K_2O	Na_2O	MnO	P_2O_5	SO_3	Ignition loss	Total	Organic matter	Nitrogen
		In.	*Per-cent*	*Per-cent*	*Per-cent*	*Per-cent*	*Per-cent*	*Per-cent*	*Per-cent*	*Per-cent*	*Per-cent*	*Per-cent*	*Per-cent*	*Per-cent*	*Per-cent*	*Per-cent*	*Per-cent*
C-107	A_2	0-9	91.25	3.03	1.32	0.57	0.07	0.16	0.32	(1)	0.04	0.06	0.05	2.69	99.56	1.67	0.07
C-108	B_1	9-20	85.53	7.30	2.61	.64	.17	.25	.37	(1)	.02	.03	.04	2.98	99.94	.41	.03
C-109	B_2	20-32	76.59	12.48	4.15	.58	.13	.46	.71	0.03	.02	.02	.10	4.82	100.09	.36	.03
C-110	B_3	32-53	73.00	13.96	5.20	.60	.15	.58	.79	.03	.02	.01	.08	5.47	99.89	.34	.03
C-111	C	53-74	67.84	15.75	7.96	.61	09	.56	.96	(1)	.03	.01	.08	6.28	100.17	.26	.02

[1] Trace.

TABLE 13.—*Chemical composition of colloids extracted from Fullerton cherty silt loam from Cherokee County, Ala.*

Sample No.	Horizon	Depth	SiO_2	Al_2O_3	Fe_2O_3	TiO_2	CaO	MgO	K_2O	Na_2O	MnO	P_2O_5	SO_3	Ignition loss	Total	Organic matter	Nitrogen
		In.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
C-107	A_2	0-9	46.71	25.83	7.78	0.67	0.42	0.80	0.86	(1)	0.08	0.44	0.19	16.39	100.17	6.42	0.51
C-108	B	9-20	48.30	27.52	9.57	.87	.28	1.07	1.08	(1)	.02	.14	.05	10.95	99.85	1.18	.10
C-109	B_2	20-32	49.79	27.19	9.33	.88	.15	1.07	1.28	(1)	.01	.09	.05	10.20	100.04	.79	.06
C-110	B_3	32-53	50.46	27.11	9.08	.83	.17	.97	1.26	(1)	.01	.08	.02	10.09	100.08	.65	.05
C-111	C	53-74	46.21	30.04	9.76	.71	.10	.91	1.48	(1)	.01	.09	(1)	10.92	100.23	.41	.24

[1] Trace.

Talbott silt loam is a normally developed soil of the county. A detailed description of a profile of a virgin area of this soil in the southwestern part of Catoosa County where the surface is gently undulating and the soil has not been disturbed by erosion is as follows:

A_0. 0 to ¼ inch, a thin surface covering of dark brownish-gray organic matter, composed of leafmold, litter, and humus.

A_{11}. ¼ to 2 inches, dark brownish-gray mellow silt loam with considerable organic matter well incorporated with the mineral soil.

A_{12}. 2 to 4 inches, grayish-brown friable silt loam with some durable organic matter.

A_{13}. 4 to 8 inches, grayish-brown friable silt loam. Organic matter has reached this layer through insect and worm workings and by sifting along old root or other channels.

A_2. 8 to 16 inches, brownish-yellow silt loam with a reddish tinge. The grayish-brown material of the overlying horizon has sifted down along old root and other channels.

B_1. 16 to 26 inches, brownish-yellow silty clay loam with a red tinge. When picked out, it breaks irregularly, and the fragments, when moist, crumble easily in the hand.

B_2. 26 to 34 inches, grayish-yellow silty clay loam with some gray mottlings and dark-brown aggregates or concretions of iron or manganese oxide. Larger roots penetrate through this layer.

C. 34 to 48 inches+, yellow heavy impervious silty clay with mottlings of gray and some buckshot-sized concretions or accretions of iron or manganese oxide.

Limestone lies at a depth of about 48 inches.

A comparison shows the pH value to be higher in the A_1 layer than in the A_2 or B_1. It gradually decreases from the A_0 downward. This points to the probability that calcium is transferred through the trees from the underlying limestone to the leaves.

The A_2 layer and all layers above it are comparatively light textured, with apparent loss of calcium, iron, and aluminum and a relative increase in silica. The A_2 layer shows less working by worms than the A_1 layer. The A layers are filled with plant roots, and, when shaken out, small, soft, somewhat rounded particles, ranging from one-twentieth to one-fourth inch in diameter, cling to them.

The Clarksville, Fullerton, Tellico, and Apison soils resemble Talbott silt loam in occurring in the upland and in having A, B, and C horizons. All these soils, however, are more friable throughout and, with the exception of the Tellico, have lower contents of organic matter in their upper layers than does the Talbott soil. The Clarksville and Fullerton soils overlie and are developed largely from beds of chert; the Tellico soil, from calcareous sandstone; and the Apison soil, from interstratified sandstone and shale. Furthermore, the Clarksville soil has the thinnest organic layer, is light gray throughout, and in its B horizon has more or less colloidal cementation and some iron oxide staining. The Fullerton soils differ from the Clarksville in that they have a little higher organic-matter content, a brownish-gray A_1, a gray A_2, and a light-red or reddish-brown B horizon, which is distinctly heavier than any part of the A horizon, evidencing the downward translocation of fine material. The Tellico soils have more durable and a greater quantity of organic matter than the Clarksville, Fullerton, or Apison soils. Its A_1 layer is brown, its A_2 layer is yellowish red and lighter in texture, and its B horizon is yellowish red. The texture of the A_2 layer is lighter and that of the B horizon is heavier than the texture of other layers of the A horizon. The Apison soils have brownish-gray A_1 layers containing a small quantity of organic matter, which is well disseminated with the fine mineral soil, a yellowish-brown A layer, which, at a depth of about 10 inches, overlies a heavier textured brownish-yellow B horizon. This, at a depth of about 15 inches, is underlain by a thin C horizon, which, at a depth of about 18 inches, rests on beds of interstratified sandstone and shale.

Dandridge silt loam, Muskingum stony fine sandy loam, and Hanceville stony fine sandy loam are well-drained soils of the uplands, having only partly developed profiles. Dandridge silt loam has a yellowish-gray, grayish-yellow, or yellow friable silt loam A horizon, little if any B horizon, and a heavy silty clay C horizon, which rests on gray calcareous shale at a depth of about 2 feet. Muskingum stony fine sandy loam has a yellowish-gray or yellowish-brown very fine sandy loam A horizon, a thin layer of yellowish-brown loam for its B horizon, and a 3- or 4-inch layer of very fine sandy loam for its C horizon. This material rests on beds of sandstone interstratified with thin beds of shale. Hanceville stony fine sandy loam differs from Muskingum stony fine sandy loam in having a reddish-brown or reddish-yellow A_2 layer, brownish-red or yellowish-red B and C horizons, and a red sandstone, interstratified with a small quantity of shale, substratum.

The essential features of the soils of the uplands having poor drainage and heavy impervious subsoil material are shown by the following description of Colbert silt loam:

A_0. 0 to 1/4 inch, dark-gray leafmold, forest litter, and partly decayed leaves.

A_{11}. 1/4 to 2 inches, brownish-gray silt loam with some organic matter well incorporated with the mineral soil.

A_{12}. 2 to 6 inches, brownish-gray silt loam.

A_2. 6 to 13 inches, light grayish-yellow silt loam.

B_1. 13 to 22 inches, yellow silty clay loam with yellowish-brown mottlings and some dark-brown or black iron or manganese oxide concretions or accretions.

C_1. 22 to 34 inches, brownish-yellow heavy impervious silty clay with gray mottlings. There are many dark-brown or black manganese or iron concretions or accretions, about the size of buckshot.

C_2. 34 to 42 inches, a layer that has the same color and consists essentially of the same material as the immediately overlying layer but differs from it in having a higher pH value.

Limestone lies at a depth of about 42 inches.

The well-drained soils of the old alluvium occurring on stream terraces are well represented by Waynesboro very fine sandy loam. A typical profile of this soil, from the surface downward, is as follows:

A_0. 0 to 1/4 inch, a surface layer of litter and a very little leafmold.

A_1. 1/4 to 4 inches, a layer of grayish-brown or brownish-gray very fine sandy loam with some organic matter that is well combined with the mineral particles.

A_{2a}. 4 to 14 inches, light yellowish-gray very fine sandy loam containing small chert and sandstone fragments ranging from the size of a pea to that of a hickory nut.

A_{2b}. 14 to 22 inches, a transitional layore between the A and B horizons, composed of grayish-yellow very fine sandy loam with reddish-yellow spots and many small fragments of chert and sandstone. With slight pressure it readily breaks to irregular-shaped lumps about the size of a pea.

B. 22 to 40 inches, yellowish-red sandy clay, which, when moist and under pressure, breaks into small lumps.

C. 40 to 50 inches, brittle friable sandy clay, which has a higher content of sand than the layer immediately above it.

The profile of Cumberland very fine sandy loam resembles that of Waynesboro very fine sandy loam, except that the A layer has a deeper brown color and a little more organic matter and the subsoil is red, presumably owing to a higher content of dehydrated iron oxide. The Sequatchie soil differs from Waynesboro very fine sandy loam in its brown color and greater perviousness throughout; whereas the Jefferson soil differs from the Waynesboro in having more boulders and cobbles throughout and in having thinner B horizons; the Allen soils are unlike the Waynesboro in having brown A_1, light reddish-yellow or brownish-yellow A_2, and light reddish-yellow or light reddish-brown B horizons, with some cobbles and boulders occurring throughout the profile; and the Wolftever soils differ from the Waynesboro in having brownish-yellow compact tough silty clay subsoils with gray, yellow, and brown mottlings and little soil development on account of restricted drainage and a comparatively short period since the soil materials were deposited.

In the deposits constituting the stream flood plains, definite soil characteristics have not yet developed. Of these, the well-drained

soils having grayish-brown or yellowish-brown surface soils and grayish-yellow or brownish-yellow friable subsoils belong to the Pope series; the intermittently drained soils with grayish-brown surface soils and light reddish-brown subsoils, with mottlings of gray and brown, belong to the Philo series; the soils with well-drained light grayish-brown surface soils and light brownish-gray subsoils resting on light-gray chert hardpan belong to the Roane series; the poorly drained soils with gray surface soils and gray acid subsoils with mottlings of light gray and yellow belong to the Atkins series; and the soils with gray surface soils and heavy neutral subsoils belong to the Melvin series.

SUMMARY

Catoosa County is in the limestone and Valley section of northwestern Georgia. The relief consists of a succession of ridges and minor valleys crossing the county in a northeast-southwest direction. All drainage waters flow north and northwest through the various forks of Chickamauga Creek to the Tennessee River.

The climate is mild, and the rainfall is ample and well distributed during the growing season. The average frost-free season is about 212 days, which is suitable for the growth of cotton on the well-drained uplands and terraces. The mild winters are suitable for the more frost-resistant garden vegetables as well as winter cover legumes and small grains.

The present agriculture consists mainly of the production of corn and forage crops in conjunction with dairying and feeding beef cattle on the soils of the uplands with heavy-textured impervious silty clay subsoils that overlie limestone or limestone and shale interstratified. On the soils that are mellow, friable, and well drained throughout, cotton, corn, and truck crops are grown for the most part.

On the basis of soil characteristics, such as color, texture, consistence, structure, reaction, organic matter, inherent and available plant nutrients, degree of slope, drainage, stoniness erodibility, and moisture-absorbing and moisture-holding capacities, the lands of Catoosa County fall naturally into 21 soil series, 23 soil types, 9 soil phases, and 2 miscellaneous land types. In accordance with their characteristics and naturally adapted uses, these soils and land types are grouped into Second-class, Third-class, Fourth-class, and Fifth-class soils.

The Second-class soils include about 34.4 percent of the total area of the county. They occur fairly well distributed over the northeastern, central, and western parts. Of the 58 square miles, 23 square miles occur on terraces or alluvial fans, 19 on flood plains along streams, and 16 on uplands. About 90 percent of the crops are produced on this land. All the soils of the uplands in this group, except Talbott silt loam, are well drained, as are the soils of the second bottoms and terraces, except Wolftever silt loam. These well-drained soils are well adapted to cotton and vegetables. The soils of the flood plains, Talbott silt loam, and Wolftever silt loam return the best crops of corn and forage.

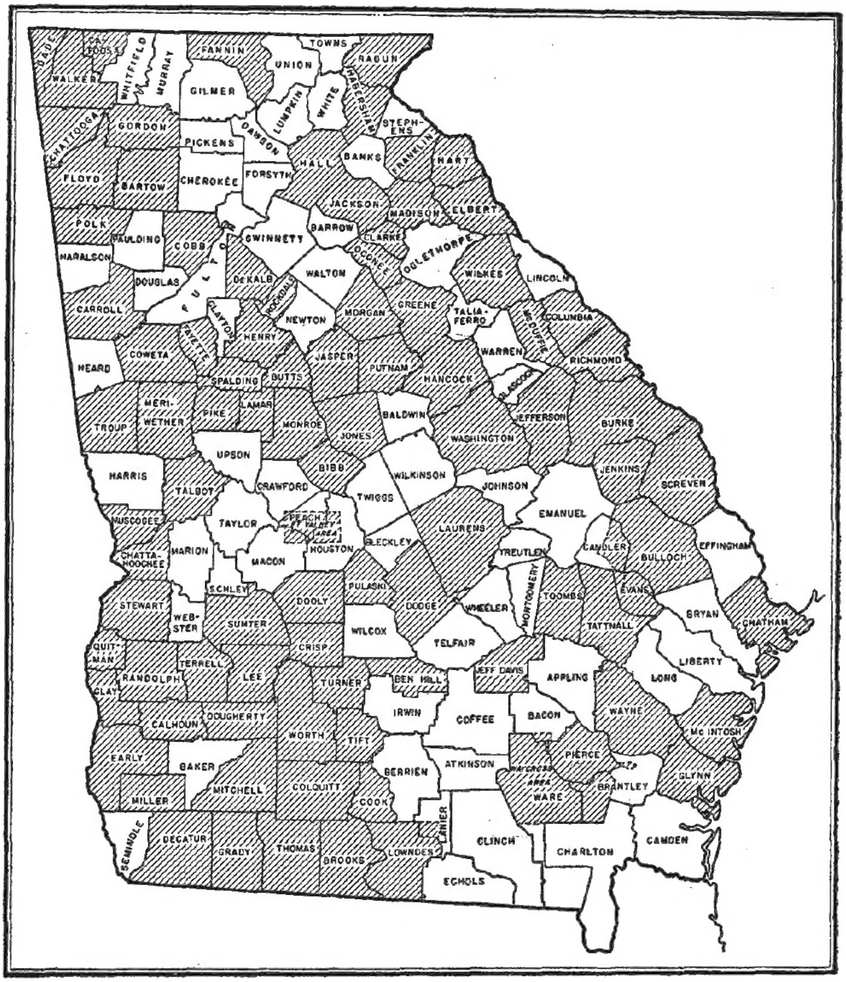
The Third-class soils comprise 21.3 percent of the total area. One-half of this land is so severely eroded that 75 percent or more of the surface soil is gone; one-fourth is underlain by heavy impervious silty clays that greatly impede the movement of ground water; and the rest is inclined to be too droughty, owing to the open subsoil material. Colbert silt loam, with its heavy impervious subsoil and impeded internal drainage, is well adapted and used for growing forage crops and grass in conjunction with dairying or beef production. Other members of this class have pervious and well-drained surface soils and subsoils and are naturally adapted and are used mostly for cotton, corn, and truck crops; but owing to the loss of so much of the surface soil from Apison very fine sandy loam and the eroded phase of Waynesboro very fine sandy loam, the steep slope of Clarksville cherty silt loam, and the stoniness of Jefferson fine sandy loam, yields are lower than for the Second-class soils.

A total of about 33 square miles, or 19.4 percent of the area of the county, is covered by Fourth-class soils. Their best use is for pasture, because of their comparatively high water-holding capacity, wetness, sloping topography, eroded condition, stoniness, or nearness of bedrock to the surface.

Fifth-class soils comprise 42 square miles, or 24.9 percent of the area of the county. These soils are best adapted to forest, as they are too hilly, steep, stony, or rough for cultivation and too droughty for pasture.

In only a general way does the map on which the various soil types and phases have been designated correspond with the present agricultural practices within the county. On many farms, slopes and severely eroded lands, which would be better in forest and pasture, are being cultivated. On the other hand, much land now in forest or permanent pasture is suitable for crops. The adjustment of land to its proper use is a fundamental step in the establishment of a constructive system of agriculture in Catoosa County.

U S GOVERNMENT PRINTING OFFICE: 1941



Areas surveyed in Georgia shown by shading.

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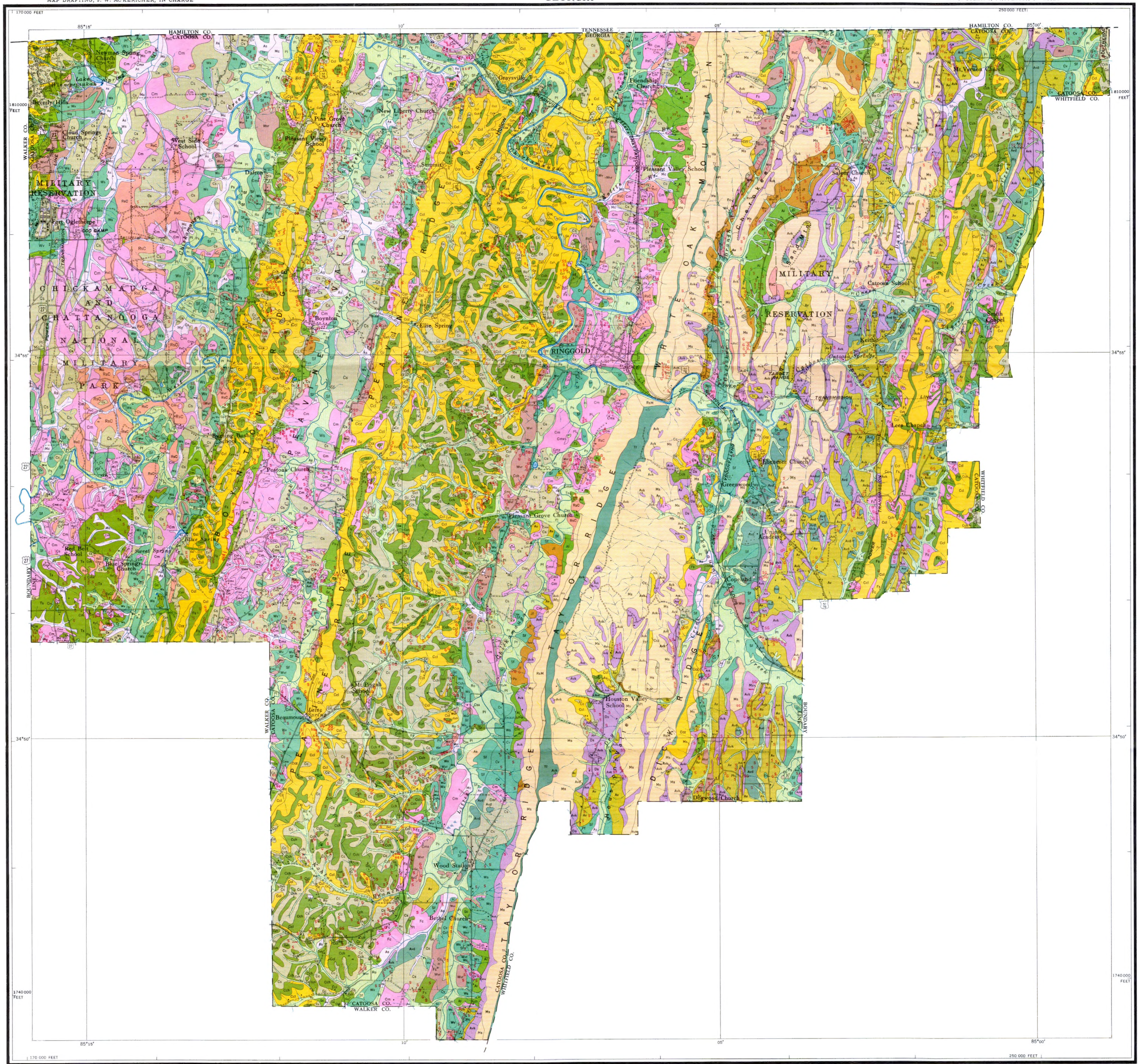
SOIL MAP
CATOOSA COUNTY
GEORGIA

UNIVERSITY OF GEORGIA, COLLEGE OF AGRICULTURE
PAUL W. CHAPMAN, DEAN
W. O. COLLINS, PROFESSOR OF SOILS



LEGEND

SECOND-CLASS SOILS

BOTTOMS
- Philo silt loam — Pl
- Pope fine sandy loam — Pf
- Pope silt loam — Ps
- Roane silt loam — Ro

COLLUVIAL SLOPES
- Allen very fine sandy loam — Al
- Greendale cherty silt loam — Gc

SMOOTH UPLANDS (On limestone and cherty limestone)
- Clarksville cherty silt loam, Smooth phase — Cch
- Fullerton silt loam — Fs
- Talbott silt loam — Ts

TERRACES
- Cumberland very fine sandy loam — Cv
- Sequatchie fine sandy loam — Sf
- Waynesboro very fine sandy loam — Wv
- Wolftever silt loam — Ws

SMOOTH UPLANDS (On sandstones and shales)
- Apison very fine sandy loam, Deep phase — Avd
- Tellico fine sandy loam — Tf

THIRD-CLASS SOILS

UPLANDS (On limestone and cherty limestone)
- Clarksville cherty silt loam — Cc
- Colbert silt loam — Cs

TERRACES
- Waynesboro very fine sandy loam, Eroded phase — Wvr

COLLUVIAL SLOPES
- Jefferson fine sandy loam — Jf

UPLANDS (On sandstones and shales)
- Apison very fine sandy loam — Av

FOURTH-CLASS SOILS

BOTTOMS
- Atkins silt loam — As
- Melvin silty clay loam — Mc

UPLANDS (On limestone and cherty limestone)
- Colbert silt loam, Slope phase — Csx
- Colbert silty clay loam — Cm
- Slope phase — Cmx
- Fullerton cherty silt loam, Eroded phase — Fc

UPLANDS (On sandstones and shales)
- Apison very fine sandy loam, Eroded slope phase — Avk
- Dandridge silt loam — Ds

STONY LAND
- Rolling stony land, Colbert soil material — RsC

FIFTH-CLASS SOILS

STEEP UPLANDS (On cherty limestone)
- Clarksville cherty silt loam — Ccl, Hill phase
- Ccz, Steep phase

STEEP UPLANDS (On sandstones and shales)
- Hanceville stony fine sandy loam — Hs
- Muskingum stony fine sandy loam — Ms
- Rough stony land, Muskingum soil material — RsM

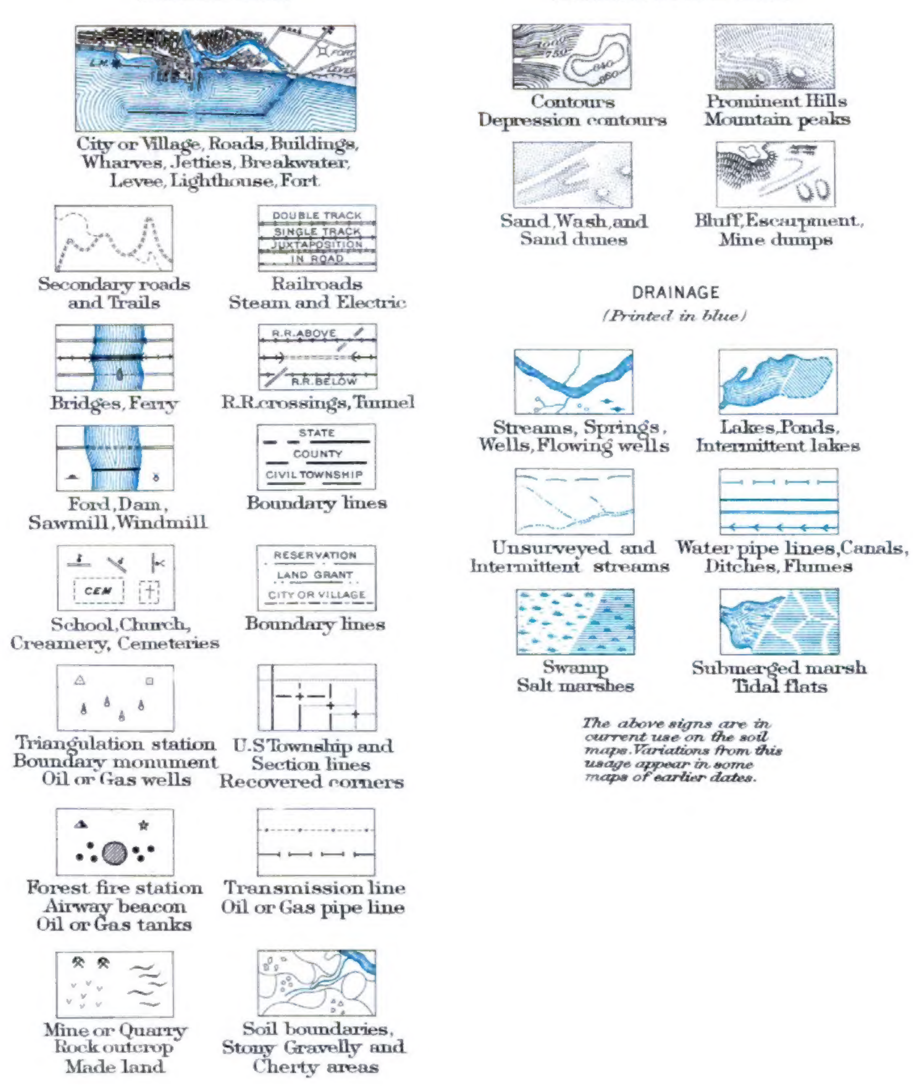
SINKHOLES AND DEPRESSIONS

- Easy to cultivate across
- Difficult to cultivate across
- Containing water most or all of the time

ACCELERATED EROSION

- S Moderate sheet erosion
- SS Severe sheet erosion
- G Moderate gully erosion
- GG Severe gully erosion
- SG Moderate sheet and gully erosion
- Gully

CONVENTIONAL SIGNS



W. Edward Hearn, Inspector, District 2.
Soils surveyed by Arthur E. Taylor, U. S. Department of Agriculture, in charge, and J. C. Mercer, G. D. Thornton, and J. H. Bowers, Jr., University of Georgia, College of Agriculture.

WILLIAMS & HEINTZ CO. WASH. D. C.

Scale $\frac{1}{48,000}$

1 ½ 0 1 2 3 Miles

5,000 0 5,000 10,000 Feet

The Tennessee Valley Authority also cooperated by supplying part of the funds and materials used in this survey.

Polyconic projection, 1927 North American Datum.
Base map in part from T. V. A. Planimetric Maps.
10000 foot grid based upon Georgia (West) system of plane coordinates.
Surveyed in 1936–37. Series 1937.